january 1953

American Foundryman

THE FOUNDRYMEN'S OWN MAGAZINE

Here are the reasons why an overwhelming majority of iron foundries, for many years, have found that molding sands prepared with seacoal, bentonite and sand stabilizer definitely can be relied upon for uniform, advantageous and thoroughly satisfactory results . . .

EASY TO USE—Because they are finely ground, dry materials, seacoal, bentonite and sand stabilizer are easy to handle, easy to add and mix with sand. Seacoal and bentonite are ground and screened in a variety of grades to suit the requirements of every type of work.

EASY SAND CONTROL—It's easy to control all of the important physical characteristics of molding sand with seacoal, bentonite and sand stabilizer. By adding the proper amount of seacoal, the carbon content can be controlled at will and changed to suit the job. Through the use of bentonite, the green and dry strength of the sand can be varied as required. The ad-mix of sand stabilizer provides control of flowability, so molds can be rammed to proper hardness. At the same time, it reduces the possibility of "buckles", "blows", "scabs", "swells", "cuts", etc., by fortifying the sand to insure proper expansion and contraction. The safe moisture range of the prepared sand is also broadened. Depending on the job to be made, moistures can safely be run higher, because sand stabilizer attracts considerable moisture to itself.

LOW COST SAND—It's not necessary to use a special grade sand or a fine mesh sand for this method of sand preparation. Any grain size may be used, so permeability is easy to control. And common lake sand may be added to the mixture as replacement.

BETTER CASTINGS—This type of sand preparation insures the production of good castings. Better casting finish is definitely obtained—pattern-true, free of surface imperfections and free of distortion.

BETTER SHAKEOUT—Cleaner, better and less-lumpy shakeouts are obtained with sand thus prepared. Sand adherence is greatly reduced, thereby minimizing the necessity for sand replacement to the heap or system.

LOWER COSTS—Seacoal is extremely low in cost. A prominent automotive production foundry determined that seacoal actually costs them only 25c per ton of castings produced. Bentonite and sand stabilizer, too, are inexpensive additives. Furthermore, low cost sand of proper grain size may be used for replacement, to keep costs to a minimum.

CROWN HILL SEACOAL ANALYSIS

Proximate (Moisture Free)	
Volatile Matter	38.9%
Fixed Carbon	57.4%
Ash	3.7%
Ultimate	
Hydrogen	5.4%
Carbon	82.0%
Nitrogen	1.6%
Oxygen	6.6%
Sulphur	.7%
Ash	3.7%
Fusion Point	2780°F

CROWN HILL Seacoal, mined by FEDERAL at Crown Hill, West Virginia, is *high* in volatile combustible matter and *low* in sulphur and ash content—basic requirements for a top quality seacoal. Check the analysis of Crown Hill Seacoal shown at the left, prepared by the U. S. Bureau of Mines.

GREEN BOND Bentonite, produced and guaranteed by FEDERAL, is unexcelled in uniformity and ability to develop and control green and dry strength. It produces high green and dry strength in sharp sands even when comprising but ½% to ¾% of the entire mixture. Truly the best of the bentonites!

FEDERAL Sand Stabilizer is a processed cellulose sand additive, greatly superior to wood flour, cereal binders, iron oxides, etc. Its high combustibility allows sand to expand evenly to eliminate casting defects. It increases sand flowability, providing much better ramming conditions. And it attracts moisture to itself, to broaden the safe moisture range.

AND HERE'S WHY THEY PREFER

CROWN HILL Seacoal,

GREEN BOND Bentonite and

FEDERAL Sand Stabilizer . . .

* * *

To learn how your foundry, too, can be assured of tailor-made sand for every job, plus easy control of the important physical characteristics of sand, at low cost—write us for informative bulletin on the use of Crown Hill Seacoal, Green Bond Bentonite and Federal Sand Stabilizer.

FEDERAL

The* FEDERAL FOUNDRY SUPPLY *Company

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American Foundryman

January 1953 / *Volume 23 • Number 1*
Published by American Foundrymen's Society

Highly ornamental sundial is composed of several 88-10-2 bronze rings cast separately—the largest 8 ft in diameter. Plaster patterns were used in making dry sand molds for rings. Sectional patterns permitted drawing parts horizontally. Flame on base was done in lost wax. Casting was produced by Dee Brass Foundry, Houston, Tex., (see story on page 36) as a memorial to the heroes of the battle of San Jacinto.

Trends

Operations and methods

Technology

In the news

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talk of the industry

REMOTE CONTROL SWING FRAME GRINDER has been developed by a leading grinding wheel manufacturer. Details cannot be made public at present. Intended primarily for ingots and billets, the grinder could be adapted to the foundry industry, particularly in high production shops.

CEILING PRICES ON MALLEABLE IRON CASTINGS can be raised 6.2 per cent according to Supplementary Regulation 1 of CPR 60, effective December 19, 1952. Based on a survey made at the request of the malleable foundries, the price adjustment was authorized because impact of cost increases, particularly increased wages, has reduced malleable foundry earnings. Prices had been frozen on the basis of January 25, 1951, costs. The government had the full support of the Malleable Founders' Society in securing data and information on industry practices.

MANAGEMENT WILL PROMOTE the man with the better safety record, all other factors being equal, according to Wm. N. Davis, director of the foundry industry's Safety & Hygiene & Air Pollution Program. He believes safety is the foreman's responsibility.

TEACH THE CHILD and reach the father with a sales pitch is the novel approach in the Christmas promotion of Cooper Alloy Foundry Co., Hillside, N. J. It's all done up in a two-sided phonograph record which briefs the book Alloys in Cooperland prepared by George Black, the company's public relations manager. On the record, "CA," a Cooper Alloy spokesman, escorts the Walrus (speaks like a British colonel) through the shop to show how stainless steel castings are produced.

BAN SCRAP EXPORTS is the advice of the iron and steel scrap advisory committees to NPA. The present supply is adequate but may be too low for comfort by late spring or summer. As of October 31, 1952, steel mills and foundries had overall inventories of 6.2 million tons of scrap—good for 60 days operation. If present high level of production continues, the committees say, maintenance of an adequate scrap supply will be difficult. Recommendation: don't export iron or steel scrap of any kind, nor tin can bundles—except in cases of extreme economic hardship—to any countries but Canada and Mexico.

ALLOY CASTING INSTITUTE has joined the National Castings Council, bringing to 10 the number of foundry organizations in the group. Representing NCC for the Institute will be ACI President Harvey T. Harrison, Duraloy Co., Scottsdale, Pa., and B. J. Gross, Key Co., East St. Louis, Ill. Other organizations in NCC are American Foundrymen's Society, Foundry Educational Foundation, Foundry Equipment Manufacturers' Association, Foundry Facing Manufacturers' Association, Gray Iron Founders' Society, Malleable Founders' Society, National Foundry Association, Non-Ferrous Founders' Society, and Steel Founders' Society.

TRAINING VETERANS under the Korean GI Bill (Veterans Readjustment Assistance Act of 1952) will be facilitated by a cooperative agreement effected recently between the U. S. Bureau of Apprenticeship and the Veterans Administration. Under the agreement, the Bureau will review and make technical recommendations on apprentice and other training-on-the-job programs submitted to the VA for national approval. In states where governors have not designated state approving agencies, the Bureau will provide inspection service to establishments seeking approval of their training programs under the new GI bill.

STUDEBAKER

USE DELTA CORE WASHES ... *Exclusively*

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Dry Dipping of jacket cores with DELTA GRAKOAT

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... FOR *QUALITY, SPEED* AND *ECONOMY*

DELTA GraKoat Wash ... (the original white plastic-type wash developed by DELTA laboratories 18 years ago) has been used consistently by leading automotive and tractor foundries ever since it was first introduced.

Here are the reasons why:

1. EASY TO APPLY
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7. ADHERES TO SAND
8. PRODUCES SMOOTHER SURFACES
9. COST LESS TO USE

A liberal working sample will gladly be sent to you, free of charge, at your request.

OTHER DELTA FOUNDRY PRODUCTS

CORE AND MOLD WASHES:

FOR ALL TYPES OF SAND CAST METALS: STEEL, GRAY IRON, MALLEABLE AND NON-FERROUS.

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•

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This New Booklet Will Give You Some Excellent Pointers — It's FREE!

What are the factors that determine the size of a foundry flask? How should steel flasks be handled? What are the recommended bushing and pin tolerances? These and many other pertinent questions are answered in a new Sterling booklet just off the press. Entitled "How to Select and Maintain Foundry Flasks", this new booklet will prove helpful to foundrymen everywhere. Ask your Sterling representative for a copy or write direct to the factory. There's no obligation involved. *Consult Sterling when in need of foundry flasks or other foundry equipment.*

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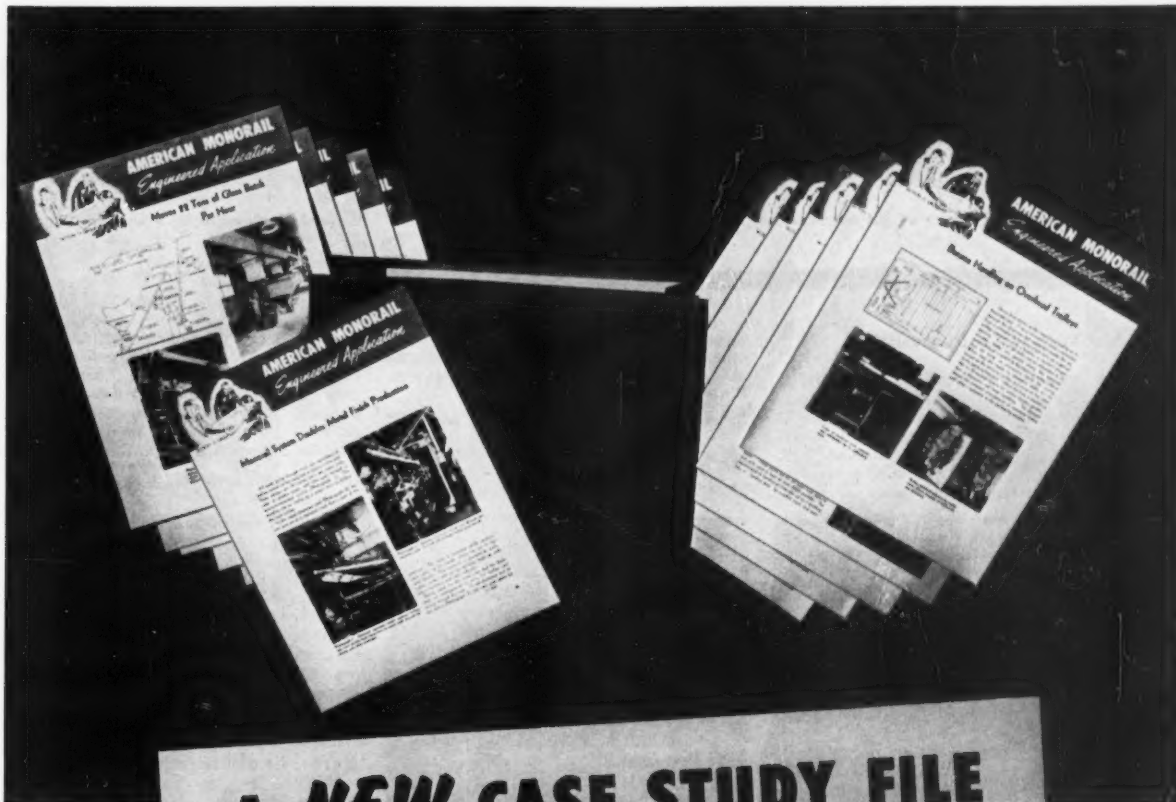

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Here's a brand new case study file which contains the first of a continuing series of case studies covering many successful American MonoRail installations.

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products and processes

For additional information,

use postcard at bottom of page seventeen.

Dust-free refractory cutting

With wet-cutting Briksaw, any number of intricate cuts on refractory and masonry materials can be made near bricklayers or furnace builders. Can be used dry where dust is unobjectionable. With wet cutting, dust and particles are swept away in constant water spray. Wet-cut-

Wet-cutting saw eliminates dust in operation.

ting kit can be purchased separately, for existing installations. *Eveready Bricksaw Co.*

For more data circle No. 1 on card, page 17.

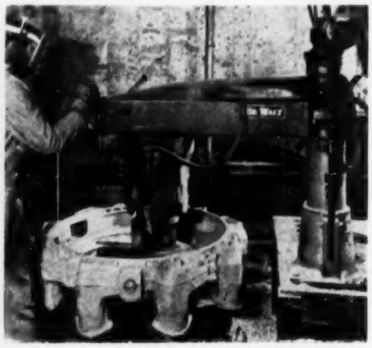
Band saw

New model Bett-Marr saw has blade speeds adjustable from 125 to 2200 rpm for cutting castings, sheet metals, plastics, wood, iron forgings and castings, and other materials. All-cast frame, adjustable motor mount, added safety features. *Bett-Marr Manufacturing Co.*

For more data circle No. 2 on card, page 17.

Heavy-duty metal cutter

The DeWalt ME-2F sprue-cutting ma-



Cutter handles sprues of up to 4-in. diameter.

chine is one of a line of heavy-duty cutters on which production has been resumed with the easing of war-time restrictions. The ME-2F cuts risers up to four inches in diameter. *DeWalt Inc.*

For more data circle No. 3 on card, page 17.

Snow plow attachment

Adding to normal foundry materials handling operations, Prime-Mover now features blade attachment for cleaning snow from parking lots and runways. Full time use is made possible by quick interchangeability of blade, bucket and two sizes of platforms. While blade is being used, bucket can be fil'ed with cinders or sand for ice control. *Prime-Mover Co.*

For more data circle No 4 on card, page 17.

Pulmonary ventilator

New instrument is designed to alleviate symptoms of silicosis, emphysema or similar disease. Pulmonary Ventilator distributes under positive pressure drugs that dilate small bronchial tubes, permitting easier inhalation and exhalation by patient. Shortness of breath is notably relieved. Described fully in Bulletin 1106-1. *Mine Safety Appliance Co.*

For more data circle No. 5 on card, page 17.

Liquid resin core binder

New phenolic type liquid resin for core bonding is claimed to have longer storage life, lower cost, excellent bond strength, and low volatility. Suitable for aluminum, bronze, gray iron, malleable, and steel castings. Soluble in water, but after baking cores have good water resistance. *Durez Plastics & Chemicals, Inc.*

For more data circle No. 6 on card, page 17.

Barrel tumbling media

Tough, white ceramic "Pebs"; uniform size and triangular shape; available in variety of sizes. With proper size selection, "lodgement" hazard, produced when random shaped natural or synthetic stone chips lodge in holes and slots, is eliminated. Easily screened for size separation, and from work being processed. *Crown Rheostat & Supply Co.*

For more data circle No. 7 on card, page 17.

Investment casting furnace

New indirect-arc electric furnace for producing precision castings by investment

continued on page 17

Blade attachment converts materials-handling cart into snowplow for clearing parking areas.

Indirect-arc furnace for precision castings.

products and processes

continued from page 14

method has melting chamber and transformer combined into single unit. Mold clamps onto shell face plate by means of compressed air. Operator pours heat by inverting furnace to allow molten metal to run into clamped-on mold. After solidification, operator releases air pressure and removes mold. *Kuhlman Electric Co.*

For more data circle No. 8 on the card below.

Safety goggles

New AO safety goggle provides frontal and lateral protection through clear plastic lens and transparent green vented binders which fit snugly to face. Gives protection over a wide area against flying particles and spattering chemicals in light grinding, hand-tool work, chemical laboratory work and others. *American Optical Co.*

For more data circle No. 9 on the card below.

Plastic pattern fillet

Master Universal Fillet, made of plastic, is economical, easy to apply, has extreme accuracy, stands up on the job. Fingertip pressure or use of a fillet tool attaches fillet permanently to wood or metal pattern sand coreboxes. Made to precise dimensions, has sharp edges, is impervious to moisture, core oils and liquid partings. Can be coated with Mater Pat-Kote, shellac, lacquer or other coating. Master Universal Fillet Cement, and solvent are available. *Kindt-Collins Co.*

For more data circle No. 10 on the card below.

Tumbling barrel

Flask-type, direct motor drive, tilting tumbling barrel is said to give better work action for deburring and burnishing of ferrous and non-ferrous precision parts. Design magnifies tumbling action. Abrasion-resisting vulcanized lining provides effective insulation. *Hupp Corporation.*

For more data circle No. 11 on the card below.

Safety hat

New fiber glass safety hat will not split, crack or deform. It is claimed to have the highest strength-weight ratio of any safety hat material. Meets A.S.A. Code for dielectric break-down and exceeds it for impact resistance. *United States Safety Device Co.*

For more data circle No. 12 on the card below.

Cover goggles

New, larger cover goggles fit over modern glasses; available for chippers and welders. Wide bearing surfaces in the molded plastic frames eliminate pressure points, provide perfect seal which keeps out flying particles or light flashes. Perforated side shields provide direct ventilation. *Chicago Eye Shield Co.*

For more data circle No. 13 on the card below.

Infrared oven panels

Pre-engineered, electric infrared oven panels have been designed to meet the need for ovens that can be built quickly, easily, and economically. The panels—in two modular sizes with built-in bus bars, insulation and frame—arrive ready to be erected in oven structures and connected to plant wiring. Energy radiated by this far-infrared generator is absorbed with practically equal speed by all colors from black to white, with negligible reflection. Even clear glass and plastics, which transmit near-infrared, absorb this far-infrared radiation. Recommended for work which requires crowding heat in a limited space, as with conveyorized degreasing, the intense radiation can also be dialed for accurately selecting and maintaining work temperatures by to 700 degrees. Once heat requirements are determined, controller dial setting can be logged and the heat output duplicated exactly at any time. Two sizes of Chromalox Radiant Panels are available 1 x 4 ft, with a capacity of 10.8 Kilowatts and 2 x 4 ft panel with 21.6 Kilowatts capacity. Output of panels is in excess of 9200 Btu's per sq ft per hr. Panels can be set up like building blocks to almost any length or height. *Edwin L. Wiegand Co.*

For more data circle No. 14 on the card below.

Steel cutting attachments

Intended for intermittent cutting on run-of-shop jobs, newly announced attachments are said to cut steel and other metals up to 8 in. thick. Increased cutting range is achieved without corresponding increase in operating pressure. Attachments fit on welding blowpipes in place of welding heads. Many types of nozzles are available for general purpose or special applications. *Linde Air Products Co.*

For more data circle No. 15 on the card below.

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53|1

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Salvaging porous castings

New low-cost method of salvaging castings rejected because of porosity, fissures or pinhole cracks is illustrated in 16-page booklet. Heated colloidal solution is circulated under pressure or vacuum through castings. Builds up successive interlocking layers for lasting metallic bond. Effective for castings under pressures to 10,000 psi. *Metallizing Company of America.*

For more data circle No. 16 on the card below.

Airless blast cleaning

New airless blast cleaning machine is illustrated in 12-page booklet. Shows features such as steel mesh door, said to be the first abrasive-proof door on the market. Other features include: heavy rubber curtain; work conveyor drive; anti-friction roller bearings; non-pinch work conveyor; heavy-duty drum ends; conveyor take-up. *Pangborn Corp.*

For more data circle No. 17 on the card below.

Dry chemical extinguisher

New nitrogen-pressurized dry chemical extinguisher is claimed to kill average fire in three seconds. Uses Dri-Kem super-fine particles, for quicker heat absorbtion and instant release of flame-smothering carbon dioxide which helps bicarbonate of soda extinguish fire. Electrical non-conductor. No danger of clogging from moisture; flows out fast, free, dry. Approved by Underwriters' Laboratories. Ask for Bulletin SF1001. *Stop-Fire Inc.*

For more data circle No. 18 on the card below.

Foundry handling systems

New series of bulletins covers the following fields in foundry materials handling: moving engine blocks from pouring loop . . . automatic delivery of core sand . . . hot metal distribution by power-operated carriers . . . automatic dispatch systems . . . and general overhead conveyor equipment. *American Monorail Co.*

For more data circle No. 19 on the card below.

Alloy castings

New 48-page book "Heat Resistant and Corrosion Resistant Alloy Castings in Industry" has 75 photographs, charts, showing creep strength, resistance to corrosion, and to oxidation. Principal Alloy Casting Institute designations listed. Typical compositions and their applications. *International Nickel.*

For more data circle No. 20 on the card below.

Colloidal graphite

Used as high temperature lubricant, colloidal graphite is unusually effective because it is inert. Clings stubbornly to sliding or rubbing friction surfaces. Adaptable to oven conveyors; kiln and furnace cars, die casting. *Acheson Colloids Co.*

For more data circle No. 21 on the card below.

X-Ray accessories

New 72-page catalog shows facilities for industrial and medical radiography. Deals with new developments such as lead glass fabrics, industrial inspection units, radioisotope fume hoods, conveyors, laboratories, etc. *Bar-Ray Products, Inc.*

For more data circle No. 22 on the card below.

Instrumental analysis

The Baird Direct Reading Spectrometer gives rapid readings on melt components in steel plants. Saves time in the melt shop. Saves money in laboratory costs. Better quality due to more uniform analysis. Routine determination of copper, tin, lead or other scrap contaminants can be made on every heat of steel as soon as melted. *Baird Associates, Inc.*

For more data circle No. 23 on the card below.

Pattern letters and figures

Sixteen page booklet illustrates line of pattern letters and figures, and foundry trademarks. Letters are die cast, for sharpness and uniformity. Large stock of letters on hand, for immediate shipment. Reverse faces available. Methods of measurement shown. *Canton Products.*

For more data circle No. 24 on the card below.

Tramrail systems

Advantages of overhead tramrail systems for foundries are: faster, safer and more economical handling. Multi-handling is avoided. Backtracking is eliminated.

continued on page 98

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CITY AND ZONE

An Important Message to the Man Who Asks:

"How Can I Increase Core Production?"

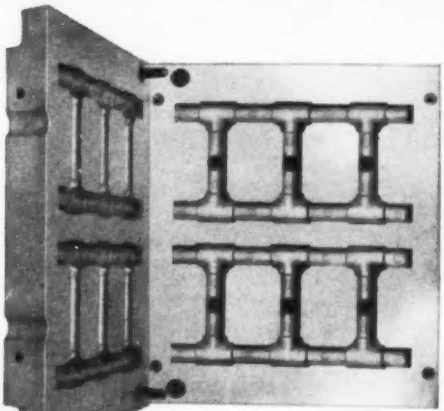
When you analyze the problem of increasing core production with your present equipment you must consider the core box itself. How much time do you lose annually with costly interruptions for core box repairs: in sampling and checking when new or repaired core boxes are put into production; and in scrapped cores because of worn cavities? Think of this time as *lost production!*

Now, see how Duplicast solves this problem for you: Because with Duplicast you find that core boxes are cheaper to replace than to repair you will have extra core boxes on hand at all times and there will be no lengthy interruptions of production schedules. No sampling or checking is necessary when a new Duplicast core box is put in production—just replace the new core box and start rolling. There'll be no fins in castings from a Duplicast core box because the accurate cavities are always *exactly* duplicated. You will realize a substantial reduction in scrap and in addition save up to 80% on core box replacement costs.

These are facts—reported by users of Duplicast from coast to coast. Wouldn't it be worth your while to investigate?

DUPLICAST

"The Expendable Core Box"



Duplicast is the ideal core box for high production schedules and for complicated irregular contoured shapes and cavities which otherwise are costly to replace or repair. Duplicast core boxes are made of a wear resistant aluminum alloy by a patented method in which a permanent hob, or mandrel, is used to duplicate any number of core boxes or dryers of exact dimensions within plus or minus .003 inches within a distance of 12 inches. Exact match on cavities can be held within plus or minus .001. Every Duplicast core box is produced with a mirror-like finish in the cavities without hand finishing or tooling of any kind.

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Gentlemen: I am interested in Duplicast and would like further information.

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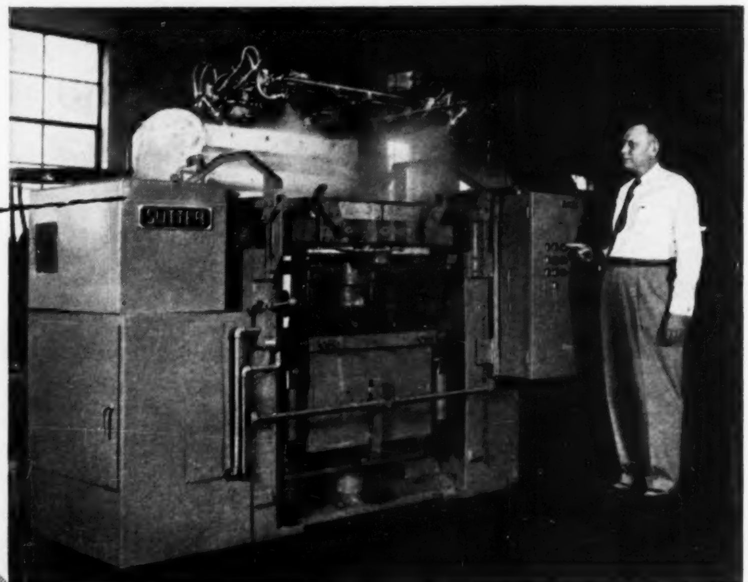

Mr. Ray Sutter at the single-station control panel of the SP-100 sand shell molding machine, made by Sutter Products, Dearborn, Michigan. The Sutter SP-100 is one of the first machines to provide a completely automatic molding cycle including closely controlled coating, temperature and curing time. Maximum shell capacity is 20" x 30" x 6"; production rate 45 to 60 shells per hour. Gasfired, electric curing oven optional.

. . . the silicone release agent that gives you clean, automatic release of sand shell molds and cores; assures fast, continuous production.

As the process for making sand shells becomes more completely automatic, Dow Corning 7 Emulsion becomes increasingly important. Effective as a release agent in hand-operated equipment, this noncorrosive, nonflammable silicone emulsion is essential to the efficient operation of high speed, automatic machines like the shell-a-minute Sutter, shown above.

Dow Corning 7 Emulsion is sprayed to cover even the most complex patterns with a very thin silicone film that gives fast, easy release. And that silicone film will not break down at curing temperatures to leave a carbonaceous deposit on the patterns. Your patterns, therefore, stay clean longer and you get shell molds with uniformly high dimensional accuracy.

Dow Corning 7 Emulsion can be quickly diluted with water to give you any concentration you may require. Try it yourself and see why the largest operators as well as the pioneers in sand shell molding techniques use Dow Corning silicone release agents.

Send for trial sample TODAY.

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Please send me
- ☐ Free sample of Dow Corning 7 Emulsion
- ☐ Data on Silicone Release Agents for the Shell Process

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Letters to the editor

All letters of broad interest which do not violate A.F.S. policy or good taste are publishable. Write to Editor, American Foundryman, 616 S. Michigan Ave., Chicago 5, Ill. Letters must be signed but will be published anonymously on request.

Rammed up and poured

Where can we obtain a copy of the book *Rammed Up and Poured* by Bill Walkins? We enjoy reading the poems from this book which you've been publishing and would like to read them all.

BRADLEY H. BOOTH
Carpenter Brothers, Inc.
Milwaukee

The number of people who have written or called about Bill Walkins' poems since they started appearing in the August 1952 issue of AMERICAN FOUNDRYMAN *(another appears on page 72 this issue) is steadily mounting. Some comment on the poems, some want a copy of the book, some want to reprint the material in their company publication. Those who can't wait until "The Foundrymen's OWN Magazine" runs through Bill's book of poetry might write to him at Electric Steel Foundry Co., Portland, Ore., copyrighters and publishers of the book. A second volume is reported in preparation.*

For safer testing

Your article "Now, There's an Idea!" describing a guard for use during transverse testing of cast iron (page 60, September 1952) recalls another device for the same purpose which we reported in our house journal "Foundry Practice." The device consists of two manganese bronze rings, each 1⅜ in. ID, 1 in. wide, and 3/16 in. thick linked by a chain. The chain is 9 in. long and is fastened to the rings by means of two ¼-in. steel thumbscrews which also act as securing screws on the test bar.

In setting up the bar for the test, the rings are slipped over the bar and securely fastened in a central position by means of the thumbscrews. When in position the chain is slightly loose so that no support is given the bar under test. When the bar breaks the two halves do not shoot out of the machine but merely fall between the knife edges.

M. N. BOYDE, *Technical Editor*
Foundry Services Ltd.
Birmingham, England

Helps build library

We have read in the 6th edition of *Foundry Sand Handbook* that A.F.S. proposes to gather a complete bibliography on all works published on foundry sands. We are pleased to send our article "The Siliceous Sands of Torre di Lago and Their Applications in the Foundry," taken from the magazine *Metallurgia Italiana* for July 1951.

DR. GUGLIELMO SOMIGLI
Dott. Guglielmo Somigli
Florence, Italy

Thank you for your interest and cooperation in helping with the task of accumulating material on foundry sands.

Answers patternmaker

The letter-to-the-editor by Wm. Deans (page 104, November issue) commenting on the book *Foundry Work* is interesting and his comments are quite to the point. I certainly appreciate the fact that Mr. Deans has taken the time to comment on the book. Constructive criticism from readers is always a great aid to an author in preparing revisions.

I understand his feelings concerning the use of the draw nail or draw spike by foundrymen when removing patterns from the mold. Many fine patterns have been damaged unnecessarily by careless use of these tools. I, like Mr. Deans, am looking forward to the day when all patternmakers will place drawing and rapping plates on all patterns. Then the foundrymen will discard the draw spike and draw nail.

Split patterns (page 13 of *Foundry Work*) are fittted together with wood or metal pins. I find that wood dowels are still used extensively in patterns and core boxes. Here again we need a little campaign for metal dowels as they do produce much better overall results.

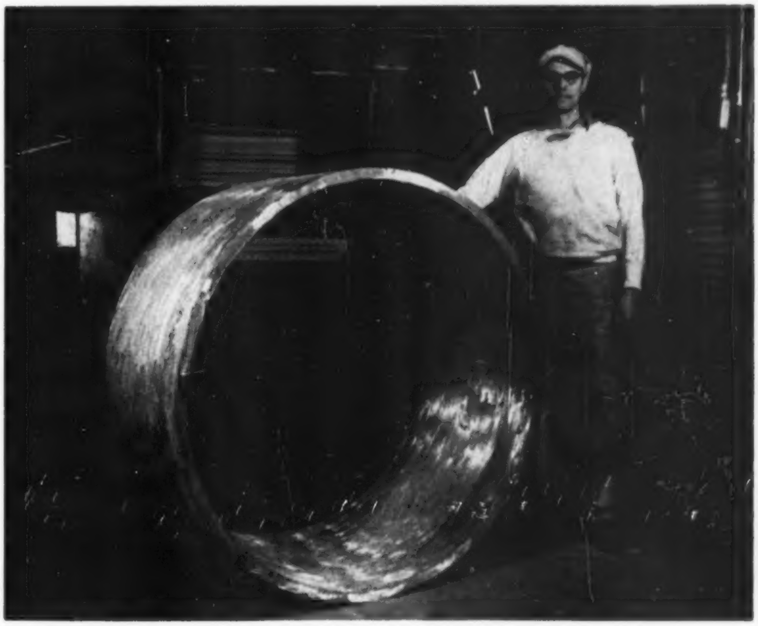
The wood flask (page 10) is still used extensively in foundries because of the ease with which it can be adapted to the job at hand. However, it is being rapidly replaced by the metal flask in the modern foundry.

The gated patterns (Fig. 7, page 14) are not female parts of hinges as is readily seen by the proportions indicated. They are used in the construction of a small bench lathe.

It is rather unfortunate that the extension of the ladle shank was omitted in making the cut for Fig. 53. I believe it is quite obvious that the man shown in the illustration is holding one end of a shank and is not pouring the mold alone. He was decidedly wrong in not wearing his goggles and leggings and I

continued on page 94

▶ *Use old technique for bronze ring*



Steve Przeklasa, foundry superintendent, Dee Brass Foundry Inc., Houston, Texas, with gun metal bronze ring for drop forge. Not deep enough to make the mold by ordinary methods, the pattern had to be raised as the drag was made using an old technique familiar to fewer and fewer foundrymen. Insulated risers were used.

Advertisement

ELECTROMET *Data Sheet*

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

VANADIUM...the metal that accentuates the effects of other alloying elements

Vanadium is usually added to steel or iron along with other alloying metals, such as manganese, tungsten, nickel, or chromium. It enhances the effect of these other alloys and helps to improve the physical properties of the metal. Generally it is used in quantities of less than 0.50 per cent, but even in these small amounts it is responsible for many marked improvements in the quality of iron and steel.

One of the most notable functions of vanadium is its effect in improving the dynamic properties of steel, such as fatigue and impact resistance. It also gives an inherently fine grain size to both steel and iron.

In high-speed tools, vanadium contributes wear resistance and red hardness. It is also an important alloy in many types of permanent magnet steels. These and many other types of special-purpose steels contain more than 0.50 per cent vanadium to enhance certain properties.

Dynamic Strength for Steels

The principal effect of vanadium in engineering steels is that of refining grain size. It is usually added in amounts of 0.10 to 0.25 per cent.

Fig. 1. Steels in which vanadium is an alloy have outstanding dynamic strength. That is why they are frequently used in such heavy-duty service as springs and axles in diesel locomotive trucks.

In the lower carbon ranges, vanadium steels are especially suited for carburizing and are used for such applications as hand tools, bearings, and pistons. Vanadium-bearing steels can also be nitrided effectively.

Vanadium contributes fatigue and impact resistance and also strength and ductility to spring steels. The famous chromium-vanadium (SAE 6100 series) and manganese-vanadium spring steels are outstanding examples of this use. Besides being used as springs, these steels are frequently used for axles, shafts, and other highly stressed moving engine parts.

Red Hardness in Tools

Practically all fine tool steels contain vanadium. In high-speed steels, vanadium content usually ranges from about 0.50 to 2.50 per cent, although higher percentages are sometimes used. Other alloy tool steels usually contain from 0.20 to 1.00 per cent vanadium.

Vanadium is a strong carbide-former and forms very hard and stable carbides. These vanadium-carbides are probably the main reason for the excellent wear resistance and edge-holding properties of vanadium tool steels. The persistence of the vanadium-carbides is largely responsible for the cutting qualities at red hardness of high-speed tool steels.

Adds Strength to Cast Iron

In amounts of 0.10 to 0.15 per cent, vanadium increases the strength of cast iron from 10 to 25 per cent, and adds a considerable amount of toughness. Cast iron containing vanadium is especially valuable in such applications as steam locomotive cylinders, valve and piston bushings, piston rings, and similar parts. In steam engines and diesel motors, vanadium cast iron cylinders greatly outlast those of ordinary cast iron. Chromium-vanadium cast iron rolls, containing up to 2 per cent chromium, have been used successfully in steel mills for a great many years.

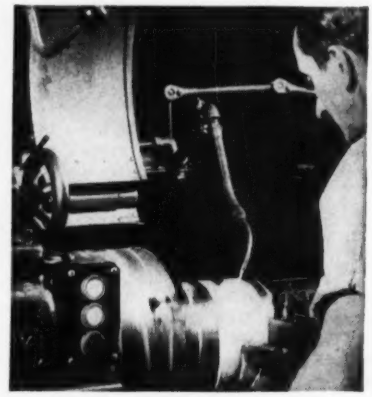


Fig. 2. Nearly all fine tool steels contain vanadium. It promotes fine grain size, high wear resistance, and greater control of hardenability. Vanadium also contributes to the red hardness of high-speed tool steels.

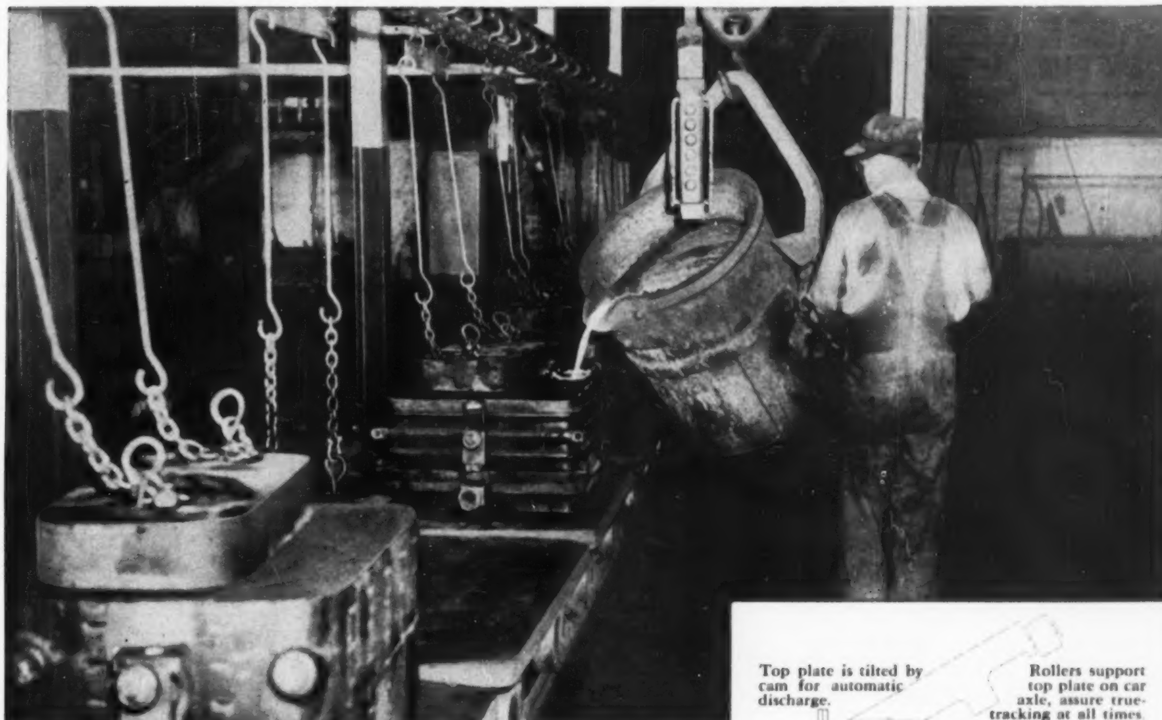
Cast iron in which vanadium is the sole alloying element is used primarily in applications where temperatures are moderately high and in heavy sections requiring uniform hardness without brittleness.

ELECTROMET Vanadium Alloys

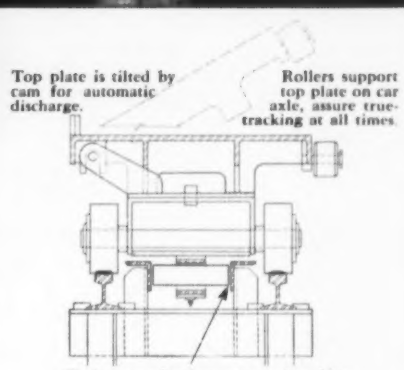
Ferrovanadium containing 50 to 55 per cent vanadium is readily available from ELECTROMET for the production of vanadium-bearing steels and irons. The alloy is produced in four grades, each with a definite range of carbon and silicon to fill the different requirements of iron and steelmaking.

Write for a copy of the booklet, "ELECTROMET Products and Service." It contains many useful facts about the use of ferrovanadium. The booklet also describes over 50 other alloys and alloying metals produced by ELECTROMET.

Move molds from closing to shakeout—continuously...automatically...at low cost



Southern pipe foundry mechanizes entire pouring operation. Tru-Trac mold conveyor, Link-Belt weight-setting overhead trolley conveyor and overhead pusher type ladle conveyor are synchronized.



Cross section of Tru-Trac mold conveyor.

LINK-BELT Tru-Trac Conveyor carries molds through molding, pouring, cooling and shakeout with maximum efficiency

MECHANIZATION by Link-Belt pays foundries big dividends in increased production . . . better casting at lower cost . . . improved working conditions. Take the Tru-Trac Mold Conveyor as an example.

Without ever leaving their individual cars, molds travel irregular paths . . . up and down inclines. Tru-Trac makes possible centralized, synchronized pouring . . . mechanical weight shifting . . . automatic mold discharge. And because exhaust hoods cover the cooling and shakeout zones, noxious smoke and fumes are eliminated.

Tru-Trac is one of several types of Link-Belt mold conveyors. Link-Belt also builds a full line of other casting and sand handling and preparation equipment. In addition, our foundry engineers can draw on Link-Belt's broad experience in foundry mechanization. It's an unbeatable combination—a sure way to bigger foundry profits.

No attendant is required at the shakeout position because of automatic dumping. Note that bottom boards are retained on the conveyor.

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LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices in Principal Cities. 13,064

FEMA

Illustration shows cope and drag set on fender pattern for STAR PATTERN & MFG. CO., Benton Harbor, Mich.

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For example, when you use Accurate cope and drag sets you get clean smooth partings. Patterns as cast are straightened and have correct alignment marks. This helps to decrease your finishing costs.

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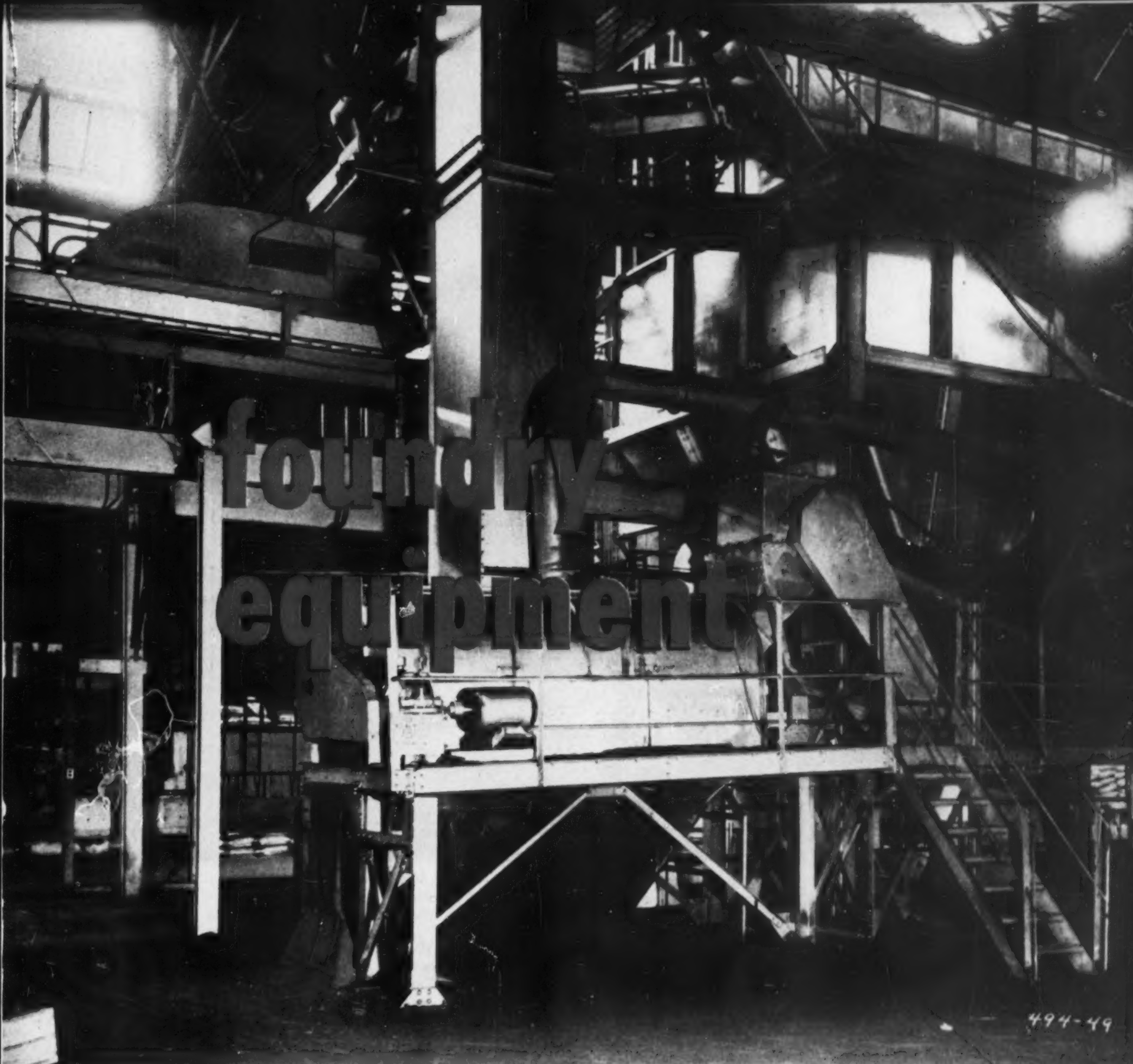
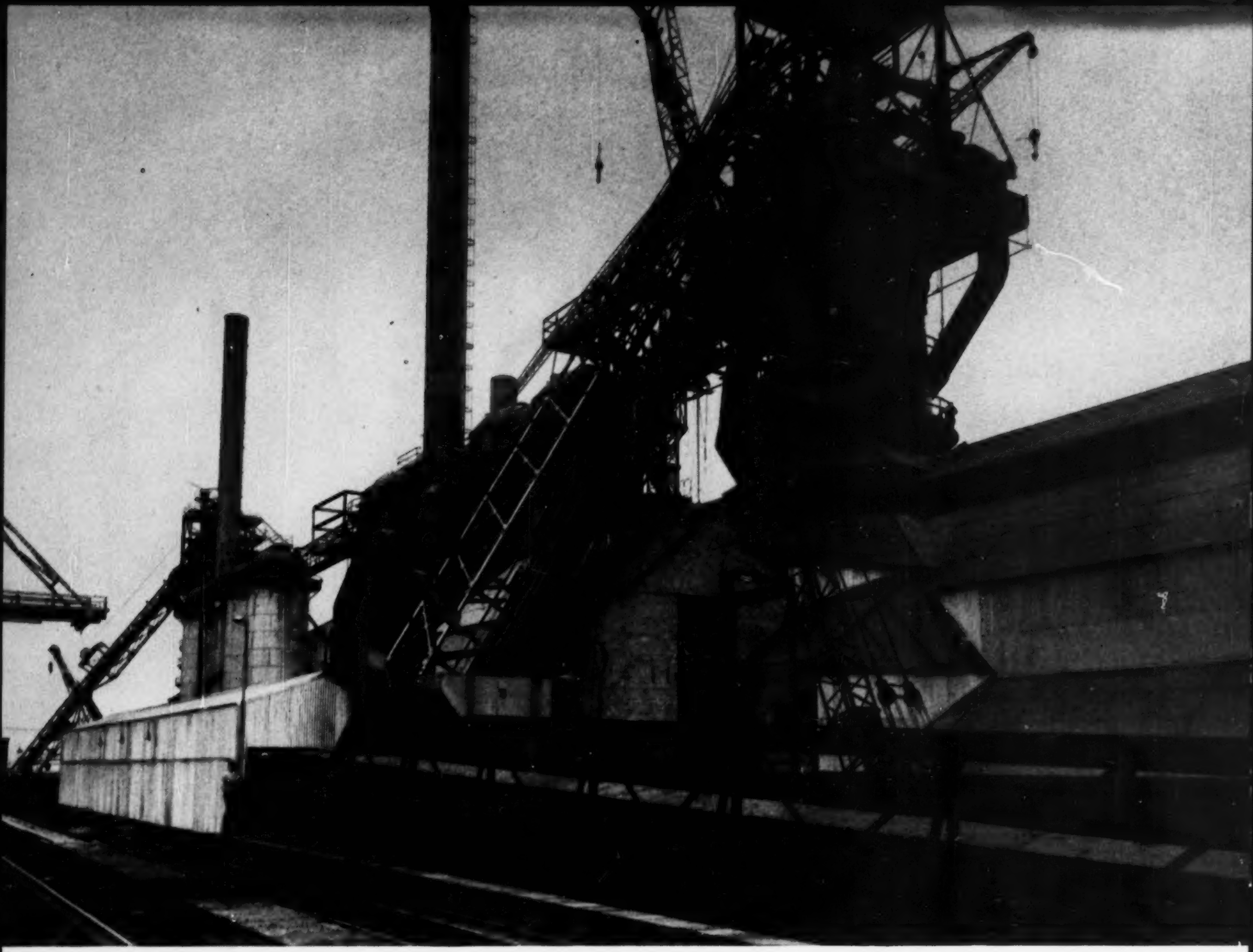




Foundrymen in the news

E. W. Reid has been elected a director by American Locomotive Co., Schenectady, N. Y. Dr. Reid is president of the Corn Products Refining Co. and recipient of the 1951 Chemical Industry Medal. Appointment of **H. L. Weinberg** as director of engineering has also been announced by the company. Mr. Weinberg will be in charge of all product development and engineering in the company's Locomotive Division. He will take over the duties of **John Thomas** who has been assigned to the administrative staff.

Arnold K. Brown, executive vice-president and a director of American Machine & Foundry Co., New York, has been re-elected a board member of the National Industrial Conference Board. The conference board is an independent non-profit institution and is a source of facts and figures bearing on all aspects of economic life and business operation. **B. W. Kinderman** has been elected comptroller of DeWalt Inc., power cutting tool manufacturing subsidiary of American Machine & Foundry Co.

Carl E. Rowe, of Milwaukee, who has been engaged in various phases of consulting engineering and in foundries in the Middle West for the past 17 years, has established his own engineering firm. His staff consists of specialists in various management fields. Mr. Rowe was for many years a member of A.F.S. Job Evaluation and Time Study Committee. Formerly he was associated with Advance Tool and Die Casting Co. as works manager, with Lester B. Knight & Associates as senior and survey engineer, with Muskegon Piston Ring Co. as planning engineer and with Daily, Brenner & Schreiber as senior management engineer. He has also held supervisory positions with International Harvester Co. and Carnegie Illinois Steel Corp. in their foundries.

Richard Schermer will manage pump sales for Durion Co., Inc., Dayton, Ohio. He joined Durion in January this year and was previously eastern district manager for Hills-McCanna Co. **R. A. Prosser** is to manage building equipment sales, and **Wendell A. Watkins** has been promoted to Chicago district manager from Buffalo, and is succeeded by **D. E. Christie.**

W. G. Munro has been appointed sales representative for National Engineering Co., in Southern Ohio and Kentucky. He has been with National in sales and service capacities since 1939, and has most recently served the midwest area as a service and erection engineer.

Victor Hornig, foundry production engineer, Foundry Services, Ltd., Birmingham, England, is completing a three-month visit to plants in United States and Canadian foundry centers. He has surveyed shell molding and special casting methods in New York, Chicago and the Midwest, Cleveland, Cincinnati, Buffalo, Detroit, Lynchburg, Baltimore, Chattanooga, and Toronto.

J. M. Planten has been appointed manager of plant engineering for the New York office of Lester B. Knight & Associates, Chicago. He has been associated with the firm since 1946.

National Bearing Div., American Brake Shoe Co., St. Louis, has announced the appointment of **Albert L. Hunt** as manager of industrial sales. Mr. Hunt joined the company's engineering department at St. Louis in 1936, becoming plant superintendent in 1942 and general superintendent of foundries for the division in 1952. He has served as a national director of A.F.S. since his election in 1951.

H. E. Ehlers has been promoted to the post of assistant general sales manager and Ralph Rathyen to manager, Crucible & Refractories Div. of Joseph Dixon Crucible Co., Jersey City, N. J.

Howard S. Avery, research metallurgist, American Brake Shoe Co., Mahwah, N. J., has been awarded the 1952 Lincoln Gold Medal of the American Welding Society. Mr. Avery received the award for a paper published this year, *"Hard Facing For Impact."* **O. B. J. Fraser,** Assistant manager of the Development and Research Div., International Nickel Co., New York, received the Samuel Wylie Miller Memorial Medal of the society in recognition of his studies of field applications and promotion of welding research.

University of Alabama has announced the appointment of **Warren Jeffery** as assistant professor of metallurgy. He had been an instructor and previously was metallurgist for Production Foundries Div., Jackson Industries, Inc., Birmingham, Ala.

New metallurgical engineer for the Pig Iron & Coal Chemicals Sales Div. of Republic Steel Corp., Cleveland, is **George P. Krumlauf.** He is a process and product metallurgist and succeeds the late **T. G. Johnston.** Before joining Republic, Mr. Krumlauf was chief metal-

Carl E. Rowe . . . . establishes new firm.

Albert L. Hunt . . . managerial appointee.

George P. Krumlauf . . . metallurgical post.

lurgist at Hamilton Foundry & Machine Co., Hamilton, Ohio. He is a native of Columbus and attended Ohio State and Franklin Universities.

Frederick C. Langenberg of the research and development laboratory, U. S. Steel Co., Pittsburgh, and **Prof. Robert D. Stout,** Lehigh University, Easton, Pa., have come up with a new test for

Frederick C. Langenberg . . . collaborates.

fluidity or castability of steel in their article on page 44. The subject has received considerable attention in the literature and numerous investigators have reported on straight and spiral channels of a variety of cross sections, as well as cup tests in which the observer times the formation of a skin on a small open mold. Langenberg and Stout report excellent results, more accurate than visual observation of skilled melters, with a simple metal mold that has been used for foundry and ingot heats.

Hyman Bornstein, chief technical consultant of Deere & Co., Moline, Ill., has accepted a temporary appointment under the United Nations Technical Assistance Program to serve as metallurgist advisor to the Government of Israel. He arrived in Israel October 21, and will remain several months. Upon completion of his mission he will return to his duties with Deere & Co. Mr. Bornstein, a past national president of A.F.S., is the chairman of the By-Laws Committee and has written many technical papers for the foundry industry. His address while abroad is Hebrew Institute of Technology, Haifa, Israel.

Clark W. Avery retired recently at the age of 70, following 45 years as a patternmaker for Joplin Foundry Co., Joplin, Mo. Mr. Avery served his foundry apprenticeship in Springfield, Mo., following his father's trade as a patternmaker. Since joining Joplin Foundry in 1907 he has been engaged principally in making patterns for mining machinery.

John D. Flloyd has been named representative in the North and South Carolina area to handle sale of resins and woodworking adhesives for the Chemical Div., Borden Co., New York.

Ralph J. Furstoss has been appointed assistant director of research, Caterpillar Tractor Co., Peoria, Ill., succeeding **Russell C. Williams,** who resigned following 20 years with the company. Mr. Furstoss was graduated from University of Notre Dame and joined Caterpillar

Prof. Robert D. Stout . . . on steel fluidity.

in 1934. He became a field engineer in 1936; later supervised field engineering.

William A. Snyder, whose article on use of olivine for molding, coremaking, ladle lining, and mold and core washes appears on page 65, comes by his interest in sand honestly. From 1932 to 1940 he was part of the Snyder Sand Co. in Minneapolis. In 1939 and 1940 he taught at the University of Minnesota before going to the University of Washington where he is assistant professor of me-

William A. Snyder . . . more uses of olivine.

chanical engineering. He has been working with olivine as a foundry refractory for two years and reported some unusual experiments, in which the surface tension of various fluids was the only binder, in the March 1952 issue of AMERICAN FOUNDRYMAN.

National Research Council's Building Research Advisory Board announced the appointment of **Homer E. Robertson** to its advisory panel on plumbing. He is a veteran of over 30 years in the plumbing field, and is the executive vice-president of the Cast Iron Soil Pipe Institute. Purposes of the panel are to propose a broad program of plumbing research, study plumbing problems resulting from war or disaster, and is aimed at conserving materials and costs.

Robert F. Tighe has been appointed manager of the Cleveland district sales office, Kaiser Aluminum & Chemical Sales Inc., Oakland, Calif., succeeding **Robert H. Black** who has been transferred to the company's general office in Oakland.

William K. Gibb was recently appointed chief inspector, Atlas Foundry & Machine Co. Tacoma, Wash. He was formerly inspector of castings at Boston Electro Steel Co. Boston, and metallurgist at the Puget Sound Navy Yard.

George O. Shutzbaugh has joined the research and development staff of Alloy Engineering & Casting Co., Champaign, Ill., as an associate director of armed services research and development projects.

American Locomotive Company's board of directors elected **Perry T. Egbert** president and **William S. Morris** executive vice president at a special meeting. **Duncan W. Fraser** will continue to serve as chairman of the board.

A. J. Dublo outlines the techniques and controls he uses in cupola operation in an article that starts on page 53. Mr. Dublo was graduated from Oberlin College in 1934 with a degree in chemistry. He did post graduate work in chemistry at Ohio State University and in metal-

A. J. Dublo . . . . . on cupola operations.

lurgy at Case Institute of Technology. He was chemist in a gold mine for one year, and taught high school sciences for four years. In 1940 he joined Sterling Foundry and is now metallurgist with its development and research division.

E. W. Petersen was recently appointed general sales manager, American Blower Corp., Detroit. Mr. Petersen, who joined the company in 1923 was merchandise manager for packaged prod-
continued on page 96

Management's stake in health and safety . . .

■ Giving impetus to the foundry industry's 15-month old Safety & Hygiene & Air Pollution Program is the noise bugaboo. An added starter, noise has recently come into the picture and looms as a potential "racket" much as, management will recall, silicosis was some 20 years ago. The antidote lies in developing facts to offset ignorance and sentiment. With the establishment of a committee to study foundry noises, the S & H & AP Program now tackles foundry health and safety problems on all fronts.

In formally starting the new Program in 1951 at the request of the National Castings Council, A.F.S. drafted as chairman Jas. R. Allan, International Harvester Co., Chicago. Mr. Allan served continuously as chairman of the former A.F.S. Safety & Hygiene Committee and is nationally known for his broad knowledge of the field. Under his guidance and through the efforts of a group of experts from foundries and equipment manufacturers were developed many valuable technical papers on safety and hygiene and the six manuals of recommended practices. Spearheading the new Program with Mr. Allan is Wm. N. Davis, director of Safety & Hygiene & Air Pollution on the A.F.S. staff.

Management is being provided through S & H & AP work the counsel of committees of experts who are developing information needed to solve an industry-wide problem. If the industry—which knows and understands its operations better than any outside group—doesn't handle such safety and health problems as may exist, there is every possibility that regulatory bodies may take over.

Well on the way toward its goals, the S & H & AP Program merits the attention of the whole foundry industry. Every company interested in the welfare of our great basic industry should participate. Large and small foundries alike face similar problems in dust control, safety, noise, and air pollution. Many have recognized this and are helping finance the 10-year program through pledges and contributions. The list (as of press time) appears as part of a story outlining Program objectives on page 58.

Many more company names are expected to be added as the solicitation of funds for the industry's long-range program gains momentum.

As management contemplates a pledge or contribution, it may well think on these compelling arguments for management support of the program: plant safety and hygiene programs are profitable . . . unless the foundry industry assumes the leadership, non-foundry groups may undertake the job and prescribe conditions that are burdensome, expensive, or unworkable . . . air pollution control vitally affects public and community relations . . . there is a surge of activity outside the industry with the underlying purpose of strengthening the field of regulatory functions . . . workmen's compensation laws are constantly costing management more money . . . the Safety & Hygiene & Air Pollution Program demonstrates effectively that the castings industry means to keep the foundry *"a GOOD Place to Work."*

Management's stake in foundry health and safety is obviously far larger than the comparatively small cost of the S & H & AP Program.

Jake Dee, president of Dee Brass Foundry, Houston, Texas, is a shirt-sleeve manager who can do any job in the shop. He did them all when the company was started in the 1930's.

Modern foundry methods

Boost production 25 per cent with mechanized sand system

About 15 months ago Dee Brass Foundry Inc., Houston, Texas, changed from manual to semi-mechanized sand handling. Results, according to Jake Dee, president of the foundry, as he looks back in more than a year of operation, is better sand control and more uniform sand properties, at least 25 per cent higher production, better working conditions, and more floor space.

■ Dee Brass Foundry produces all types and sizes of brass, bronze, and aluminum castings. Bulk of the production is cast in natural, New York sand; a few aluminum jobs are being produced in permanent molds. Operations are carried on in four buildings occupying about a 100 x 200 ft land area with adjacent sand storage bins having a capacity of 350 tons and roofed flask storage areas. An office with pattern storage on the second floor occupies one building. An adjacent small building houses materials and locker rooms. Bracketing the two buildings is the L-shaped brass and bronze foundry, cleaning and finishing department. The fourth building, parallel to the brass foundry, houses the aluminum shop on

Molding and pouring area in the copper alloy section of Dee Brass Foundry. Each of the five machine molders has a conveyor for finished molds, a second for return of flasks and bottom boards. Space is often saved by stacking molds.

Heavy-muller type sand mixer with aerator prepares sand for molders. Bottom-dump cart is used to distribute sand.

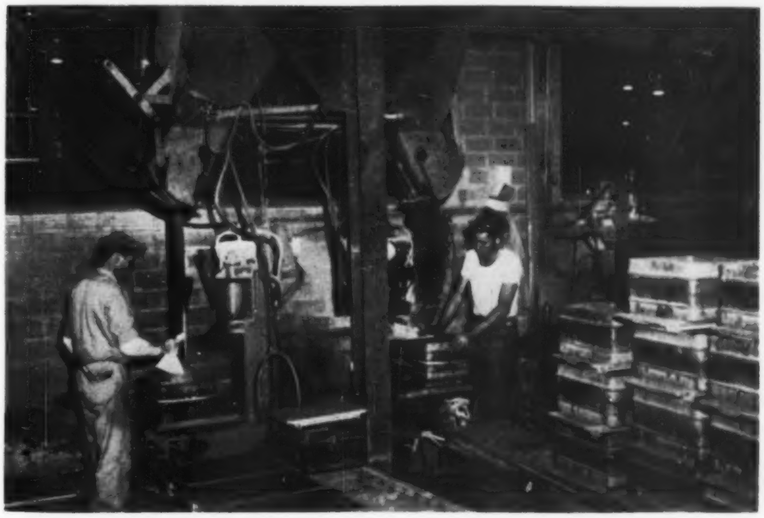
the first floor and the core room on the second.

Molders in the two foundries operate their machines on the two sides of the common wall between the shops. The sand system parallels the two lines of molding machines at the second floor level, enabling molding hoppers to be filled readily with conditioned sand prepared in a heavy-muller-type mixer. Sand is distributed to hoppers in a bottom-dump, two-wheeled cart by the sand mill operator who drops the sand through grated openings in the second floor.

Sand for reconditioning comes up from the shakeout via skip hoist. The hoist bucket is filled with sand which passes through a vibrating screen located in a pit after the molds are dumped on a grizzly about two feet off the floor.

Sand is mixed in a heavy-muller-type unit in 750-lb batches, the operator adding moisture until the sand feels right. Moisture determinations, in which the sand specimen is dried by a current of warm air passing through it, are made each hour as a check. A natural molding sand is used for both copper and aluminum alloys. Sand strength is kept up by adding new sand at the shakeout, the amount having been determined by experience. Because batch melting is used, pouring and shakeout go on all day. When the skip of used sand becomes full the load is hoisted, dumped, and preparation of another batch starts.

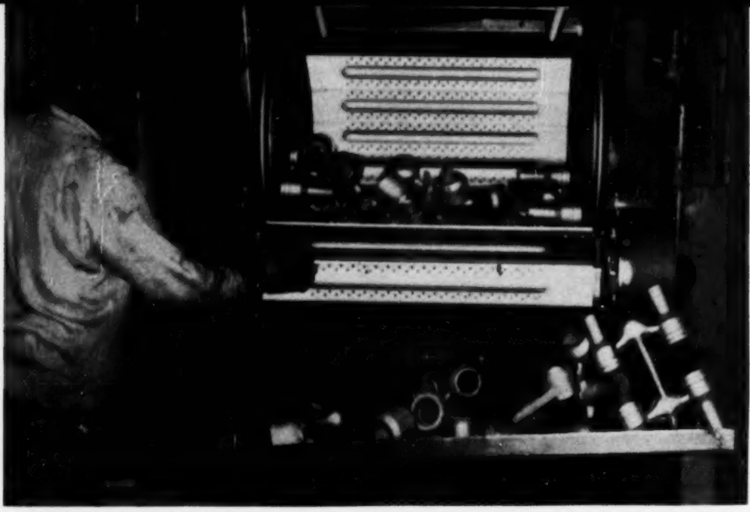
Jolt-squeeze machines are used for most of the work turned out although some loose pattern bench and floor work is done. In the brass shop the molders place their molds on roll conveyors at the usual height. Each molder has a flask return conveyor paralleling the one on which molds are stored and poured. Molds are poured from crucibles suspended from tramrails. The roll conveyors on the aluminum side are laid directly on the floor because molds are poured from hand ladles. For convenience in placing molds on the floor-level conveyors,



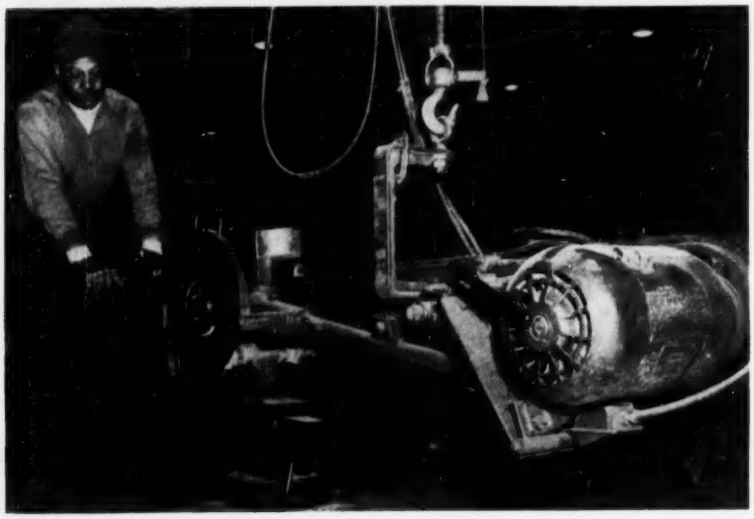
Machine molders in the aluminum shop receive their sand from the same overhead source as the brass molders on the other side of the wall. Molders work in pits so floor-level roll conveyors will be at right height for setting molds down.

Runway at second floor level permits operator to determine height of sand in hoppers and to distribute as needed.

Shake-out pit and vibrating screen before guard fence was installed. Skip hoist at left lifts screened sand to mixer where water is added. Since photo was made a grizzly has been set up to prevent castings from falling into pit.



Copper-base alloy castings are rapidly cleaned in airless-blast tumbling barrel.



Swing frame cutoff wheel is used on large, unwieldy castings, table model for small, readily-handled, copper-alloy castings is conveniently located nearby.

the aluminum molding machines are set in shallow pits in which the molders work.

Originally, wooden bottom boards were used but the shop is converting to aluminum boards cast from spills in the aluminum shop.

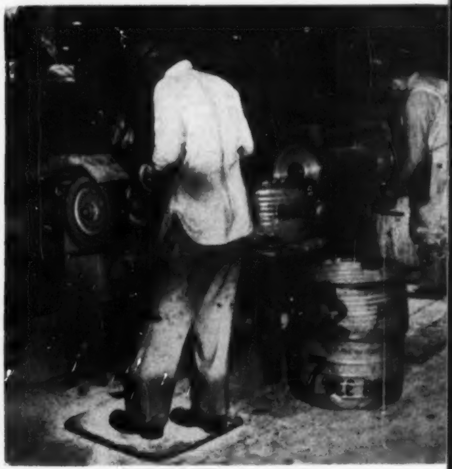
Match plates, and patterns are stored in the second floor of the office building, occupying 2500 sq ft. All shelves and shelf areas are designated by number for convenience in locating pattern equipment rapidly and returning it to its place. When a pattern in storage is to be used it is brought into the pattern shop for checking, then sent to the production room for assignment. Patterns requiring changes and new jobs also pass through the pattern shop. When a pattern is taken out of the molding department, it is again checked, and repaired if necessary, before being returned to its assigned place in pattern storage.

Gates not cut

No gates are cut at Dee Brass Foundry. Gates are an integral part of the pattern equipment; set-gates are used on loose patterns. The plant superintendent specifies the size, type, and location of gates and risers in cooperation with the production manager. Chills are extensively used for the larger copper alloy castings. Most of these chills are cast in plaster from manganese bronze or aluminum bronze. For large jobs, where such chills would tie up excessive quantities of costly metal, iron chills purchased from a gray iron shop are used. Insulated pads and risers

Double-end stand grinders are used for finishing copper alloy castings as they move toward shipping dock.

In the aluminum shop, a band saw speedily cuts gates and risers from the light metal castings after core removal.



Belt sanders are used for finishing sand and permanent mold castings produced in the aluminum casting shop.

are often used for reducing solidification rate and increasing yield. In green sand molds these are positioned by the molder. In core jobs, the plaster sleeves are integral parts of the cover core.

Production all scheduled

Status of all jobs in the shop is posted on a convenient production control board in the office. Like a huge cribbage board, with pegs in the holes to indicate progress from day to day, the board indicates date in which shipment is scheduled and dates on which all preceding major steps must be completed. Thus, anyone can tell at a glance where each job stands and promises of shipment can be made with confidence by the sales department.

Melting and metal storage facilities for copper and aluminum alloys are separate. Scrap and ingot are carefully segregated in bins marked with the alloy number. For brass and bronze, gas-fired furnaces are used. They include a 1200-lb tilting furnace, a 700-lb crucible type pit furnace, and seven 350-lb crucible furnaces, also in pits. Aluminum alloys are melted in a 225-lb and a 125-lb tilting furnace supplemented by a 300-lb holding furnace.

On critical copper alloy castings, two tests are commonly used for checking melt quality. They are the zinc test to check on combustion conditions and a shrink test to determine gas content. In the latter, a cylinder 2-in. in diameter and 8 in. high is cast in green sand. If shrinkage is not right, the metal is returned to the furnace and refluxed.

Common brick floor

The floor in the melting and pouring areas is common brick laid flat on a one-inch sand bed overlaying a seven-inch concrete slab. The bricks are laid dry and can readily be replaced when damaged. Ordinarily they are replaced at six- or seven-year intervals. A concrete floor is used in areas where molten metal will not reach it.

At shakeout, copper alloy castings are put in wheelbarrows or tote boxes and and transported to an airless-blast, tumbling barrel. Gates and risers that require cutting are removed by either of two cut-off wheels—a table model for small castings and a swing frame model for large castings. Castings are finished on double-end stand grinders and on sanding belts.

Core knockout from aluminum alloy castings, where required, is often done by vibrating briefly a cluster of castings with an air chisel jabbed into the top of a riser. Gates and risers are cut off with a band saw. Castings are finished on grinders and belt sanders.

The 5000-sq ft core room, on the second floor of the aluminum foundry, contains complete facilities for producing cores and extensive shelving for storing cores, boxes, and driers. Before a pattern is put in the sand, all the cores required for the run are made. Core sand is washed, dried, and screened from the San Jacinto River bed. Cores are bonded with oil and cereal and usually mixed in a small wheelbarrow-type mixer. A paddle-type mixer is on a standby basis.

Cores, produced with three blowers and by hand, are baked in gas-fired, thermostatically-controlled ovens. Ventilated hoods over oven doors keep smoke from baked cores from getting into the room.

Throughout the plant, safe practices and good working conditions prevail. All workmen wear the safety equipment their jobs require. Melting areas are specially ventilated. Locker rooms, complete with showers, are provided.

Cast memorial sun dial

Products of Dee Brass Foundry include not only commercial nonferrous castings of all types, but also solid and cored bushing material available from stock. Another stock item is an aluminum alloy permanent mold job; the casting produced is part of a scale for checking the consistency of oil well drilling mud.

But Dee talents aren't confined to industrial castings. When the Daughters of the Republic of Texas decided in 1937 that the money which had been accumulating since 1853 for a memorial to those killed in the battle of San Jacinto was sufficient to go ahead, they chose the Dee Brass Foundry for the job. Julian Muench, Houston sculptor, designed and produced the necessary plaster patterns and Dee produced the castings for the sun dial pictured on the cover of this month's AMERICAN FOUNDRYMAN.

The largest ring is eight feet in diameter and all parts were cast in dry sand. The flame on the base was done by the lost wax process.

Preparing core sand in portable mixer. Sand comes from local river bed.

Three coreblowers in the Dee Brass Foundry are supplemented by hand operations on bench and floor work.

Unlimited housing available for

1953 CONVENTION

■ More hotel rooms and more suites have been made available to 1953 A.F.S. Convention (May 4-8) attendants by four closely-grouped Chicago hotels than have been available for any previous non-exhibit foundry convention anywhere. The four hotels—Morrison, La Salle, Bismarck, and Sherman—all boarder on an area of only two city blocks in Chicago's Loop.

Unlike previous years, there will be no Housing Bureau. Room applications, which were sent to all

J. H. Smith, General Motors, will deliver 1953 Charles Edgar Hoyt Lecture.

A.F.S. members about the middle of January, are to be sent directly to the first choice hotel of the applicant.

Since the tentative program was first published in October 1952, two Brass & Bronze Shop Course sessions, an additional light metals session, and two more safety, hygiene and air pollution sessions have been added. Early in the planning it was evident that additional time was required and the 1953 Convention was expanded to five days, a day longer than the customary non-exhibit meeting.

Convention paper receipts were heavy the first half of December as authors rushed to meet the 15th of the month deadline. Receipt of a paper by that date assures preprint-

continued on page 101

Tentative Program . . . 57th Annual Meeting
American Foundrymen's Society
Chicago, May 4-8, 1953

Monday, May 4

8:30 a.m. . . Registration begins
10:00 a.m. . . Technical Sessions
Light Metals
Brass & Bronze
Malleable
12:00 noon . Light Metals Round Table Luncheon
2:00 p.m. . . Technical Sessions
Malleable
Brass & Bronze
Educational
4:00 p.m. . . Technical Session
Light Metals
8:00 p.m. . . Gray Iron Shop Course
Sand Shop Course
Brass & Bronze Shop

Tuesday, May 5

8:30 a.m. . . Registration opens
10:00 a.m. . . Technical Sessions
Light Metals
Heat Transfer
Malleable
12:00 noon . Brass & Bronze Round Table Luncheon
Malleable Round Table Luncheon
2:00 p.m. . . Technical Sessions
Light Metals
Heat Transfer
Educational
4:00 p.m. . . Technical Sessions
Pattern
Brass & Bronze
Safety & Hygiene & Air Pollution
Light Metals
6:30 p.m. . . Educational Dinner
Canadian Dinner
8:00 p.m. . . Gray Iron Shop Course
Sand Shop Course
Brass & Bronze Shop

Wednesday, May 6

8:30 a.m. . . Registration opens
9:00 a.m. . . Past Presidents' Breakfast
10:00 a.m. . . Technical Sessions
Sand Reclamation
Safety & Hygiene & Air Pollution
12:00 noon . Pattern Round Table Luncheon
2:00 p.m. . . Sand Reclamation
4:00 p.m. . . Technical Sessions
Refractories
Timestudy & Methods
Safety & Hygiene & Air Pollution
7:00 p.m. . . Annual Banquet

Thursday, May 7

9:00 a.m. . . Registration opens
10:00 a.m. . . Business Meeting
Charles Edgar Hoyt Annual Lecture
12:00 noon . Gray Iron Round Table Luncheon
Steel Round Table Luncheon
2:00 p.m. . . Technical Sessions
Sand
Foundry Cost
Refractories
Plant & Equipment
4:00 p.m. . . Technical Sessions
Gray Iron
Steel
Timestudy & Methods
Safety & Hygiene & Air Pollution
7:00 p.m. . . A. F. S. Alumni Dinner
8:00 p.m. . . Gray Iron Shop Course
Sand Shop Course
Plant & Equipment

Friday, May 8

9:00 a.m. . . Registration opens
10:00 a.m. . . Technical Sessions
Gray Iron
Steel
Sand
2:00 p.m. . . Technical Sessions
Gray Iron
Steel

Custom cores cut casting costs and save time for busy foundries

Making cores for shops whose core rooms are overloaded or producing cores for extraordinary jobs are all in the day's work for Coremakers Co. Here's a story on how the company operates.

▪ Wondering why no one else apparently had thought of the idea before, Edward I. Schumm, who had managed a brass foundry in Chicago for a number of years, got the idea that there was a definite need for an organization to produce cores on a custom basis. Such an organization, he believed, would be helpful to foundries that had no coremaking facilities, that had bottlenecks in their own corerooms, or that had special core problems. Thus costs could be reduced, quality maintained and delivery time cut.

The practice is now an established part of the foundry industry. Coremakers Co., Chicago, started out with five employees and now has five times as many. The West Division St. plant is the third location for Coremakers in Chicago. The company started out in 1942 in a small brass foundry that was not operating because of a shortage of brass materials. After three months the company leased and equipped a plant of approximately 6200 sq ft on Carroll Ave.

Straight line layout

In 1946 considerably more space was required for core making so operations were moved to the present location. The former plant was equipped with a home-made, coke-fired, delivery of a commercial oven of the capacity desired being at that time unobtainable.

The new plant was laid out to provide straight-line flow of cores from sand unloading at the back to truck loading of finished cores at the street entrance. Figure 2 shows the floor layout.

Fig. 1 . . . Mr. Schumm and his foreman review a casting sent in by a customer, for core assembly procedure.

During the war production period of World War II, as many as 50 were employed in core making. As many as 10,000 cores have been made in a two-shift day, for shipment to foundries within a 500-mile radius from Chicago. The cores vary in size from one-ounce pin cores to complicated ones weighing 300 lb.

Fig. 2 . . . Assembly-line layout makes for smooth flow of work through all coremaking operations and shipment to customer.

Around 300 tons of sand per month are used in core production. The sand generally used is bank sand from Michigan, which is received by truck.

The core sand is prepared in a muller equipped with an electric skip hoist. Oil is added in the muller, and water is added later as needed. The proportions of sand, flour, oil and water vary as to cores for the various metals to be cast. Where the core sand mixture is not specified by the customer, the company will provide one that will produce satisfactory cores. Coremakers Co. supplies cores for iron, steel, aluminum and brass. Sand is taken to core benches and blowers by barrow.

Use core blowers

Both floor and bench type core blowers are used. Figure 7 shows core box being removed from core after blowing. Green cores are stored on racks preparatory to baking.

Floor work on large cores is done at several stations. An automatic wire cutter is used for cutting and straightening wires. Figure 10 shows one of the rollover machines used for making medium size cores. A bench type core blower produces pin cores fourteen at a time. This multiple corebox is shown in Fig. 3. The company sometimes suggests changes in coreboxes supplied by customers, if better cores or higher production can be obtained.

Two double-compartment gas-fired 1,000,000 btu ovens bake 20,000 lb in 8 hr. Two shifts are maintained so that cores made during the afternoon can be baked during the evening. The ovens are designed to accommodate 8 adjustable-shelved trucks at the same time, two in each double compartment. Each section of the oven is a semi-independent baking unit with its own separate doors, one at each end. Cores are arranged on trucks according to baking-size, then baked at 450 F. When baked, each load is at once withdrawn from the oven through the opposite door, leaving room for prompt loading of a new truckload.

After baking, the cores are put on steel sheets that can be pushed easily on roller conveyor sections from the baking department to the truck loading end, where they are pasted and trimmed.

Returnable shallow wooden boxes are used for shipping cores by truck to foundries in Chicago. Cores to be shipped out of town are packed in

Fig. 3 . . . Turning out pin cores blown with small, bench-type core blower.

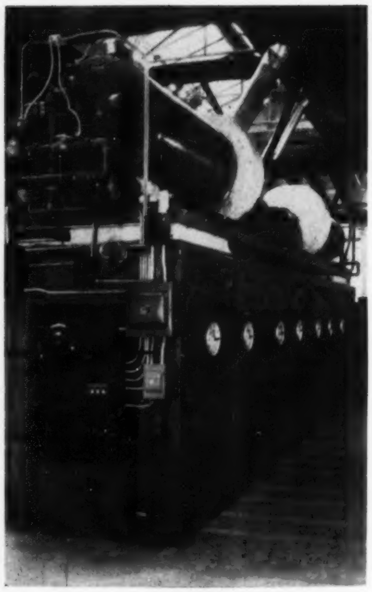


Fig. 4 . . . Gas-fired, multiple core oven is automatically controlled.

Fig. 5 . . . Unloading core sand that has been prepared in a mixer equipped with an electric skip hoist. Oil, flour, and water are used in the mixes.

Fig. 6 . . . Positioning reinforcing rods in large, hand-rammed core.

Fig. 7 . . . Cores made in this blower will be stored on rack until baked.

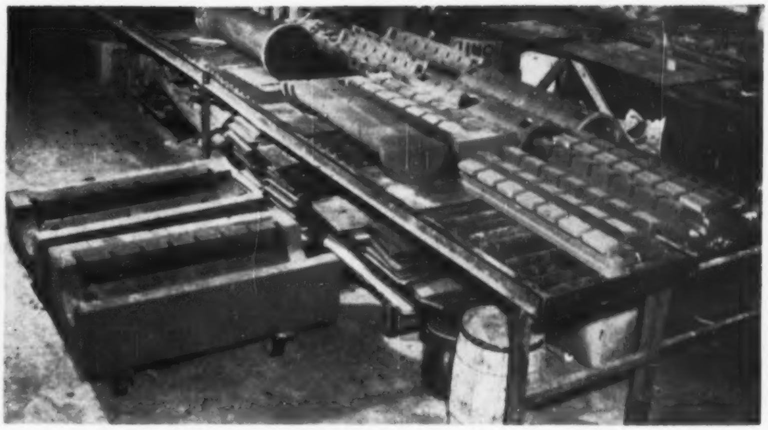


Fig. 8 . . . Molds and core sections for a casting which will be a housing for a water-jacketed motor. The mold is furnished ready-to-pour by Coremakers.

cartons. Sawdust is used as the packing material and very little breakage has been encountered.

For several customers, ready-to-pour molds, complete with cores, are provided. Figure 8 shows the molds and core sections for the casting which is a housing for a water-jacketed motor.

For fast and accurate handling of re-ordered cores, complete records are kept on all coremaking jobs handled. This includes information as to sand, part number, production run, disposition of corebox, and other factors. At present, no shell core molding is done but the company is equipped to produce such cores when required.

Plant housekeeping, hygiene and safety measures pose no special problem for this operation. The ovens have forced exhaust to remove fumes, and are equipped with automatic heat controls and limit switches.

Fig. 9 . . . Baked cores rest on steel sheets on roller conveyors. After pasting and trimming they are loaded into boxes or cartons for shipment. Sawdust has proved to be a very satisfactory material for packing the cores.

Fig. 10 . . . Rollover machine for making medium size cores.

Fig. 11 . . . Truck load of green cores being loaded into one of the oven compartments. After baking, the cores are withdrawn at opposite door.

Using a permanent steel mold to

Measure ferrous metal fluidity

F. C. LANGENBERG / *United States Steel Co., Pittsburgh*
R. D. STOUT / *Professor of Metallurgy, Lehigh University, Bethlehem, Pa.*

The fluidity of molten steel is difficult to judge from the appearance of the metal. However, it can be measured by the use of a straight-channel carbon steel permanent mold, which has consistency of dimensions, permits repeated use, and has speed and ease in assembly. The authors report on the procedures and results of tests on a variety of steels.

■ Fluidity is a term which commonly is used to designate two different properties of liquid metals. The physicist defines fluidity as the reciprocal of the coefficient of viscosity, and gives to the term fluidity an absolute meaning. The metallurgist considers fluidity in a broader aspect, defining it as the ability of a metal to flow freely, and thus to fill a mold and reproduce the desired contours "before such freezing occurs as would offer an obstruction to its further flow"*. To show how general is this latter definition, the foundry often uses the terms "fluidity," "castability," "runability," "life," "fluid life," "flowing power," and "shankability" synonymously.

While the physicist's definition of fluidity is too restrictive to be of use to the practical metallurgist, the generality of the metallurgist's definition often leads to confusion and misinterpretation of fluidity test results. The ability of a metal to flow should not be mistaken for the ability of the metal to fill a mold evenly and thus produce a satisfactory casting. The mold filling ability would be improved by increased ability to flow, but this does not mean that "castability" and "flowing power" can be used interchangeably.

This paper is concerned with the ability of molten steel to flow in a permanent steel mold. To the authors' knowledge, this is the first time a metal mold has been used to measure the fluidity of steel. The fluidity is more exactly defined in this paper as the ability of the metal to flow in a permanent steel mold under a falling temperature gradient.

The mold which was used to measure the fluidity of the steels tested in this investigation is shown in Fig. 1. It consists of a pouring basin, a runner connecting the pouring basin with a sprue, the sprue, itself, and a fluidity channel which extends outwards from the side of the sprue near its base. The relative fluidity of the steels was determined by measuring the length of flow of the metal in the channel.

The mold

The straight-channel mold was made from a 0.20 carbon steel. A low carbon steel was chosen because of its high melting point and good machining properties. The permanent mold was used because it offers a greater consistency of dimensions and heat transfer than a sand mold. The steel mold can be used for many tests and it can be rapidly and easily assembled.

To design a mold that would be

*C. W. Briggs, "Fluidity of Metals" *Metals Handbook*, American Society of Metals, Cleveland, 99-204, (1948).

Measuring temperature prior to pouring fluidity test during development of mold and technique at Lehigh University.

Removing fluidity specimen from mold. Casting is readily knocked out of cope. Rod ran several times length shown.

both sensitive and reproducible, it was necessary to control the mold variables which influence the flow of metal into the channel. There had to be a proper balance among (1) the forces acting to drive through the flow channel, (2) the cross-section and length of the flow channel, and (3) the thermal characteristics of the mold. The ideal condition for fluidity testing exists if these variables are so controlled that the pressure on the metal at the mouth of the flow channel is the same, for the same metal, from test to test; and so that the rate at which the mold extracts heat from the metal remains the same for every test.

Test procedure

The tests that were made for determining the fluidity of cast steel were made at a seven-ton electric furnace.

The fluidity mold was coated with carbon black from an acetylene flame, assembled, and placed on the floor immediately in front of the furnace. The mold was leveled with a carpenter's level. When the time came to take a fluidity sample, the temperature of the metal in the furnace was measured with an immersion thermocouple. Immediately after the temperature was taken, a test was poured. Then the mold was disassembled and the length of the metal in the fluidity channel was measured.

A pouring spoon was used to remove the metal sample from the furnace. This spoon was revolved in the bath for several seconds before a sample was taken. This action heated the spoon to a high temperature and helped retain the heat in the molten sample. Slag remaining on top of the metal in the spoon was removed with a wooden stick just before the fluidity test was poured. Keeping the slag over the spoon sample prevented oxidation by the atmosphere and helped also to retain heat in the metal. The tests were poured as rapidly as possible, to facilitate a uniform pouring rate. When the pouring rate was obviously too slow, or if there was splashing or overflow, the test at fault was not included. After a little practice, the men had no trouble duplicating their pouring rates, therefore there were no discards.

A platinum-10 per cent rhodium immersion thermocouple was used in measuring the temperature of the steel in the furnace. Samples were taken from the same part of the bath

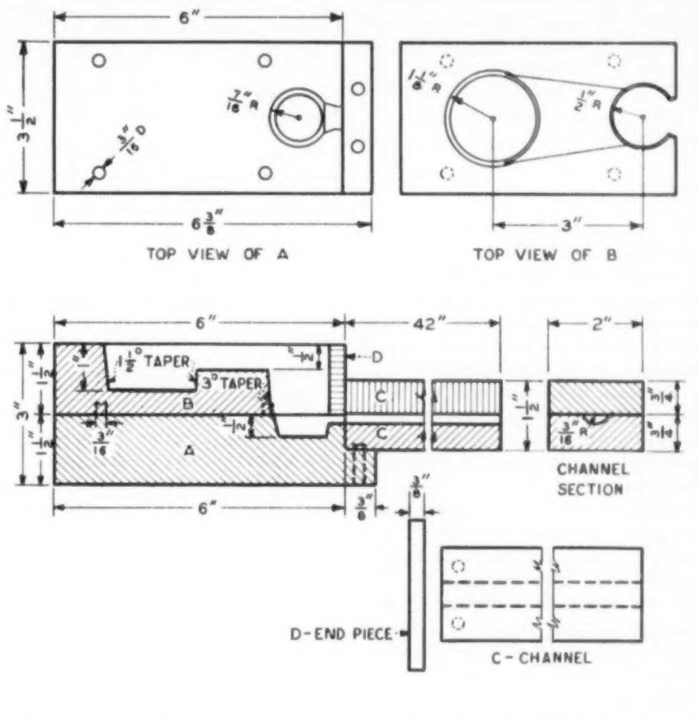


Fig. 1 . . . Assembly of fluidity test mold shows its simple construction.

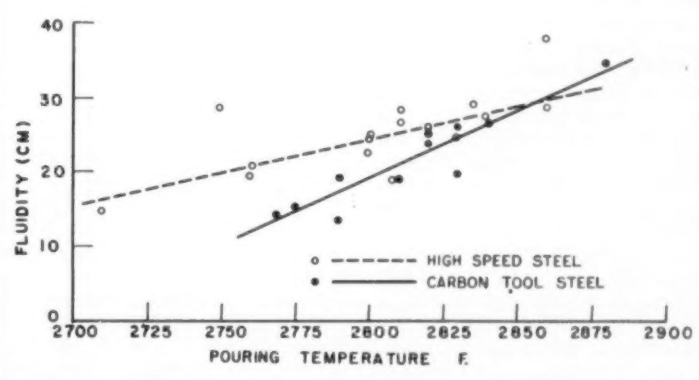


Fig. 2 . . . Relation between pouring temperature and fluidity of high speed steel and carbon tool steel as measured by permanent metal mold.

in which the thermocouple was submerged, to be sure that the temperatures of the sample and the couple were the same. This precaution was necessary because of the temperature differences that exist in a large steel bath.

All tests were taken immediately before the heat was tapped. At this time the slag over the metal bath was very reducing and the steel thoroughly deoxidized. Making tests immediately before the heat was tapped permitted the use of the ladle analysis, which is always taken and recorded on heat sheets, for the analysis of the fluidity specimen. The closeness of the ladle analysis to that of the fluidity specimen is shown in Table 1.

The opinions of the furnace men concerning the fluidity of the metal were obtained, and recorded for each heat.

The data on the steel fluidity tests are presented in Table 2. Fluidity-

temperature curves are shown for a plain carbon tool steel, (Table 2, Reference No. 1) and for a high speed steel (Table 2, Reference No. 2) in Fig. 2. The melting points were obtained for the steels in Table 2 and a plot of fluidity against superheat is shown in Fig. 3.

Results

The agreement between the furnacemen's verdicts and the actual test results was only fair. While the opinions did not vary much for the same grade of steel, even though different shifts were passing judgment, the lack of agreement between the workers' judgment and the test results indicates that fluidity is hard to judge by observation of the metal, even when the observers are experienced steel men.

A study of the data accumulated was made in an attempt to find a relationship between the fluidity measurements and the analyses of the metal. No correlation was found between any of the elements present in the samples and the corresponding fluidity. Thus, analyses for the samples shown in Table 2 are not given. They represent nine steels; compositions are available on request.

Figure 2 shows that the fluidity of a given steel increases with temperature. Figure 3 relates fluidity to superheat. Nine different steels of widely varying composition are included in this graph. From Fig. 3 it can be seen that superheat is the dominant factor affecting fluidity, and that pouring temperature is important because of its relation to superheat.

If one steel poured at a low temperature has more superheat, it will have greater fluidity than a second steel poured at a higher temperature. Composition is important therefore because of the effect on the melting range. Elements which lower the liquidus increase the fluidity; and conversely elements which raise the liquidus decrease the fluidity.

When the linear fluidity-superheat curve in Fig. 3 is extrapolated, the line of regression intercepts the ordinate at 2.3 centimeters. This implies that at the liquidus temperature or the temperature of zero superheat steels still have some fluidity. Since there can be no fluidity when the solidus is reached, the temperature of zero fluidity lies somewhere between the liquidus and the solidus.

Acknowledgment is made to the

TABLE 1 . . . SIMILARITY OF ANALYSES

	C	Mn	P	S	Si	Ni	Cr	Va	Mo	Cu
Ladle Analysis	1.09	0.28	0.011	0.019	0.19	0.08	0.65	0.21	0.02	0.08
Specimen Analysis	1.09	0.28	0.010	0.011	0.24	0.08	0.62	0.19	0.02	0.11
Ladle Analysis	1.05	0.28	0.012	0.013	0.09	0.10	0.21	0.19	0.03	0.09
Specimen Analysis	1.03	0.26	0.011	0.010	0.13	0.10	0.11	0.19	0.03	0.10

TABLE 2 . . . DATA ON STEELS REFERRED TO IN FIG. 3

Reference Number	Temperature (F)	(C)	Fluidity (cm)	Fluidity Verdict of Furnace Men	Melting Point (F)	(C)
1	2790	1532	13.5	Low fluidity	2650	1454
1	2830	1554	19.7	Fluid	2650	1454
1	2830	1554	26.2	Fluid	2650	1454
1	2770	1521	15.0	Fluid	2650	1454
1	2810	1543	18.8	Low fluidity	2680	1471
1	2880	1582	34.2	High fluidity	2650	1454
1	2820	1549	25.0	Fluid	2670	1466
1	2820	1549	23.8	Fluid	2670	1466
1	2775	1524	15.2	Low fluidity	2660	1460
1	2790	1532	19.6	Fluid	2660	1460
2	2810	1543	18.3	Low fluidity	2600	1427
2	2810	1543	26.2	Low fluidity	2600	1427
2	2835	1557	28.3	Fluid	2600	1427
2	2860	1571	28.5	Fluid	2600	1427
2	2860	1571	37.9	Fluid	2600	1427
2	2820	1549	25.9	Fluid	2600	1427
2	2840	1560	27.3	Fluid	2600	1427
2	2840	1560	26.1	Fluid	2600	1427
2	2830	1554	24.8	Fluid	2600	1427
2	2800	1538	24.6	Fluid	2600	1427
2	2810	1543	28.0	Fluid	2600	1427
2	2760	1516	19.1	Fluid	2600	1427
2	2760	1516	20.3	Fluid	2600	1427
2	2710	1488	14.6	Low fluidity	2600	1427
2	2750	1510	28.2	Low fluidity	2600	1427
2	2800	1538	21.7	Fluid	2600	1427
2	2800	1538	23.7	Fluid	2600	1427
3	2820	1549	32.5	Low fluidity	2557	1403
3	2850	1566	39.6	Fluid	2557	1403
3	2810	1543	35.1	Low fluidity	2577	1403
3	2810	1543	33.4	Low fluidity	2577	1403
4	2800	1538	15.8	Fluid	2650	1454
4	2800	1538	15.8	Fluid	2650	1454
4	2800	1538	19.0	Fluid	2652	1456
4	2800	1538	17.0	Fluid	2652	1456
4	2800	1538	14.3	Fluid	2652	1456
5	2910	1599	28.2	High fluidity	2708	1487
5	2940	1616	34.8	High fluidity	2708	1487
6	2860	1571	20.6	Fluid	2725	1496
7	2800	1538	16.5	Fluid	2690	1477
8	2820	1549	19.5	Low fluidity	2665	1463
9	2790	1532	25.5	Low fluidity	2640	1449
9	2790	1532	20.1	Low fluidity	2640	1449
9	2790	1532	24.3	Low fluidity	2640	1449
9	2810	1543	19.8	Low fluidity	2640	1449

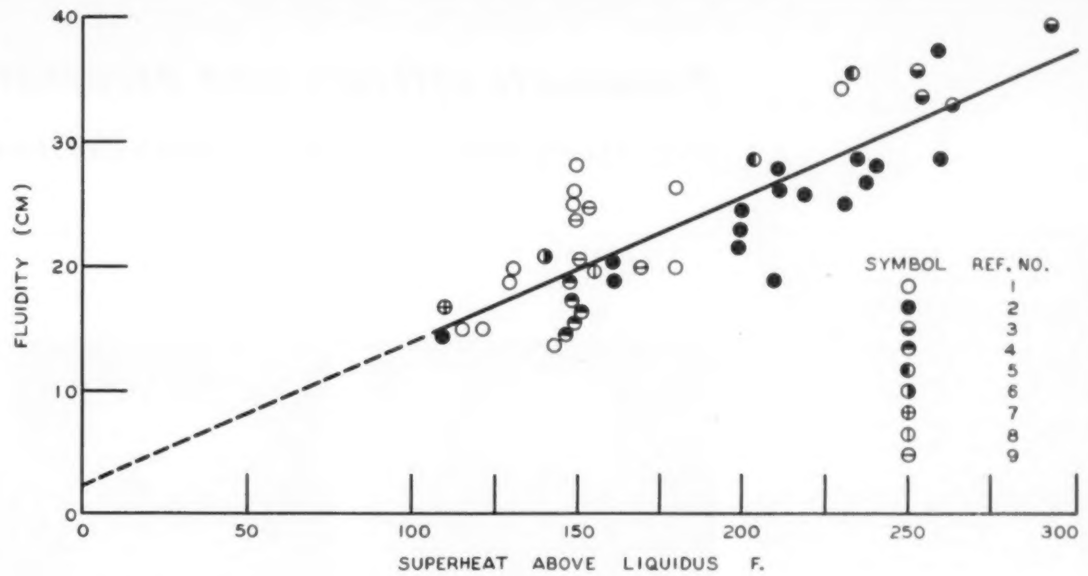


FIGURE 3 - FLUIDITY-SUPERHEAT RELATIONSHIP FOR NINE DIFFERENT STEELS

Bethlehem Steel Co., Bethlehem, Pa., for the assistance offered in material and personnel. Such help has enabled us to reach these conclusions.

1. Fluidity of molten steel can be measured by the use of a permanent steel mold as outlined in this paper.

2. The fluidity of molten steel is difficult to judge by the appearance of the metal.

3. The degree of superheat is the controlling factor influencing the fluidity of steels. Temperature and composition are important because of their effect on superheat.

4. The temperature of zero fluidity for steels lies somewhere between the liquids and the solidus.

▸ *Issue five new publications for foundrymen*

Within a 45-day period covering the end of 1952 and the start of 1953, the American Foundrymen's Society has issued five new publications which foundrymen will want to add to their libraries. The five are:

Transactions of A.F.S., vol. 60, containing papers presented at the week-long 1952 International Foundry Congress.

Patternmaker's Manual, the first edition of a much-needed book bound to be popular with all who make, design, or purchase patterns.

A Study of the Principles of Gating as Applied to Sprue-Base Design, progress report on A.F.S.-sponsored research on metal flow, reprinted from *Transactions*, vol. 60.

Health Protection in Foundry Practice, 19 papers presented at a foundry health conference held at the University of Michigan.

Symposium on Air Pollution, five papers presented at the 1952 International Foundry Congress, reprinted from *Transactions*, vol. 60.

The latest volume of *Transactions* contains 860 pages and 101 papers presented at last year's A.F.S. Convention. Also included are annual reports of officers, financial statements, and Board meeting minutes. Previously available at a prepublication price of $6.00, *Transactions* can now be purchased by members of the Society for $8.00, and by nonmembers for $15.00. Postage is prepaid on this, as on all publications, if remittance accompanies the order.

Contents of *Transactions* covers every phase of foundry practice and operation. With each paper is the discussion and exchange of ideas and response of speakers to questions which followed presentation.

Patternmaker's Manual is a 279-page, hard-bound book containing the practical knowledge of patternmaking developed by a committee of the country's leading pattern experts or contributed by others willing to share their trade secrets and short cuts. Much of the subject matter originated with members of the Pattern Div. of A.F.S. Price of *Patternmaker's Manual* will be announced.

The third progress report on principles of gating gives details of the gating research which so many foundrymen have seen in brief on the color-sound motion pictures produced by A.F.S. *A Study of the Principles of Gating as Applied to Sprue-Base Design* constitutes an excellent permanent record of the movie for those interested in improving their gating. Prices: members, 50¢; non-members, 75¢.

Health Protection in Foundry Practice is a 170-page, paper-bound book containing 19 papers on dust control, nature of disease caused by dust, and foundry health problems and their cure. Member price is $3.00; non-member price is $4.50.

Symposium on Air Pollution, the second publication issued recently in this field, is priced at $1.75 for members, $2.50 for non-members.

These five publications are available now from American Foundrymen's Society, 616 S. Michigan Ave., Chicago 5, Ill.

Nominate officers and directors for election at A.S.F. convention


Collins L. Carter


Frank J. Dost


E. C. Hoenicke


V. F. Stine


M. J. Lefler


G. Ewing Tait


I. R. Wagner


C. V. Nass

■ Collins L. Carter, Albion Malleable Iron Co., Albion, Mich., has been nominated for the presidency of the American Foundrymen's Society for 1953-54. Now vice-president, he was named to succeed the present president, I. R. Wagner, Electric Steel Castings Co., Indianapolis, Ind., by the Nominating Committee which met in Chicago December 12.

Frank J. Dost, president of Sterling Foundry Co., Wellington, Ohio, has been named to succeed Mr. Carter as vice-president for 1953-54. Mr. Dost served a three-year term ending in 1947 as a national director.

Five new directors were nominated to serve three-year terms beginning in 1953. They are:

E. C. Hoenicke, general manager, Foundry Div., Eaton Mfg. Co., Detroit.

Martin J. Lefler, plant manager, Plant No. 1, Oliver Corp., South Bend, Ind.

Chester V. Nass, vice-president, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago.

Victor F. Stine, vice-president and sales manager, Pangborn Corp., Hagerstown, Md.

G. Ewing Tait, manager of foundries, Dominion Engineering Works, Ltd., Montreal, Que.

President Wagner automatically becomes a director for one year on completion of his term.

National directors who will complete their terms in July are:

J. J. McFadyen, vice-president and general manager, Galt Malleable Iron Co., Galt, Ont.

J. O. Ostergren, president, Lakey Foundry & Machine Co., Muskegon.

Walter L. Seelbach, president, Superior Foundry, Inc., Cleveland.

Frank W. Shipley, foundry manager, Caterpillar Tractor Co., Peoria.

James Thomson, chief works engineer, Continental Foundry & Machine Co., East Chicago, Ind.

E. C. Troy, foundry engineer, Palmyra, N. J.

Nominations for officers and directors of A.F.S. are announced in accordance with the By-Laws which require that the report of the Nominating Committee be published at least 60 days prior to the Annual Business Meeting. Thereafter and at any time 45 days prior to the date of the meeting additional nominations may be made by written petition filed with the secretary of the Society and signed by 35 members in good standing.

Should no candidates be nominated by petition, the secretary *"shall, at the Annual Business Meeting, cast the unanimous ballot of all members for the election of the candidates named in the report of the Nominating Committee, and as published to the membership"* as prescribed by the By-Laws. If additional candidates are nominated by petition, the By-Laws require that elections shall be by letter ballot.

How to build up circular patterns from segments

Methods of cutting segments for circular and cylindrical patterns shapes and three ways of holding segments together are told in this excerpt from the A.F.S. *Patternmaker's Manual* issued the first of the year. Also covering when the three methods should be used, the article is indicative of the practical nature of the book prepared by members of the Pattern Division. Much of the material is original work of the authors and their colleagues.

▪ Patterns of a circular nature are commonly built up of rows of blocks known in shop terminology as "segments." A segment, literally defined, is "any part of a circle bounded by an arc and a chord of that circle." In the mechanical arts this term is applied also to circular pieces like those bounded by concentric arcs and radial lines, usually of parallel thickness.

In shop language a row of segments is known as a "course." A pattern may be made of a single course, or there may be a number of courses with alternate joints overlapping as in Sketch A, Fig. 1. This system is frequently employed to build curved shapes, such as rings or ribs and other pattern members requiring strong or rigid construction.

It should be mentioned, too, that a pattern should never be constructed of two courses of segments because it will not hold shape. The stresses set up, as the material shrinks or expands, will inevitably cause distortion. In three or more courses, these stresses are effectively equalized.

Segment division

Any convenient number of spaces may be used to divide a circle; however the best division usually is six segments. Using the radius as the chord length, six equal chords will be obtained. Another advantage is that a sixth segment, laid lengthwise with the grain of the wood, turns clean and smooth in the lathe. If fewer segments are used, the wood will have a tendency to rough-up as the tool turns against the grain of the wood.

Proper grain

If the job is to be lathe turned, vertically grained lumber should not be used for segment work. The short grain has a tendency to chip out at the joints or feather on the surface. Slashed grained boards make better segments because the annular rings of the wood, which have the toughest fibres, are vertical to the pattern surface.

Three ways of joining segments are shown in Fig. 1. The second method, Sketch B, is used for thin sections such as pipe flanges which may be economically made of single course segments spliced together at the joints.

The splice is made by cutting

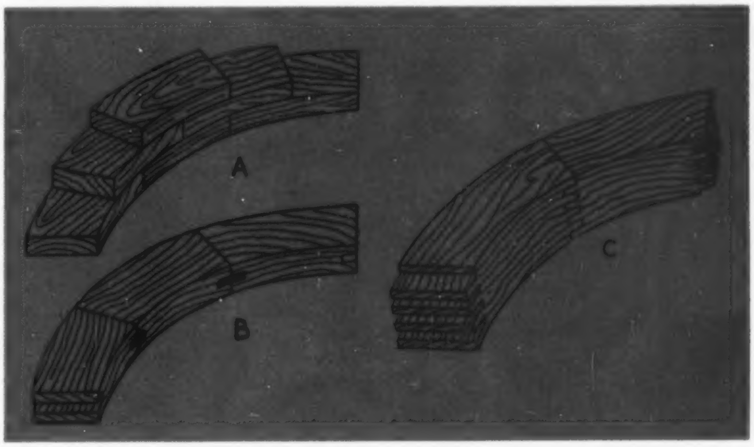


Fig. 1 . . . Methods of segment construction. A—courses with alternate joints overlapping. B—single course segments spliced at joints by insertion of a spline. C—multiple spline system. Splines are integral with the segment.

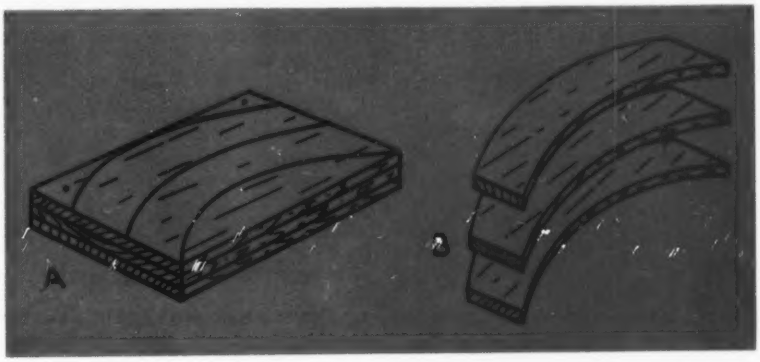


Fig. 2 . . . Time can be saved when a number of segments are cut in one operation. Material is stacked and cut is marked from a template.

matching saw kerfs in the segment ends and inserting a so-called "spline" to join the pieces together. The spline, which is separate from the segment, is made with the grain running with the segment so that it is not easily broken.

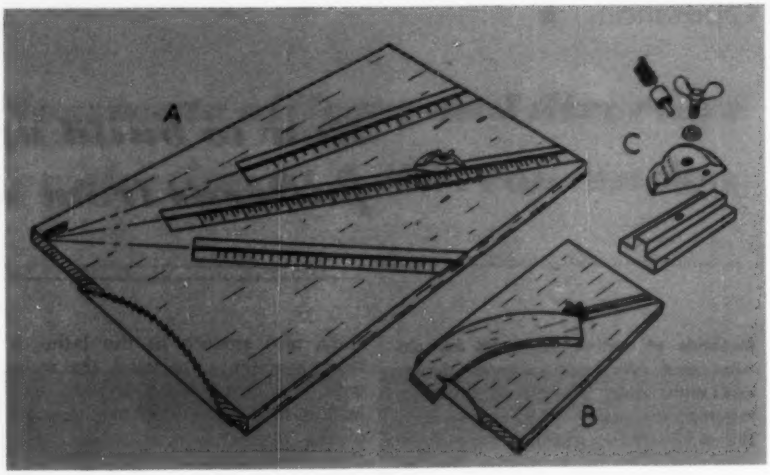


Fig. 3 . . . A—board used on saw table to gage radial lines of segments. B—stops on the board locate the segment at the proper cutting angle. C—details of gage pin.

Segment board

When a number of segments are required it is good practice to lay out and cut a template, stack the material, mark from the template and cut a number at one operation, as shown in Fig. 2, Sketches A and B.

Figure 3, Sketch A, shows a segment board that is used on the combination saw table to cut radial lines of segments. The board should be of straight-grained hardwood with a metal slide on the bottom to fit the saw table. The segment rests against two stops, one at each end, which locate it at the proper angle to cut radial lines.

The back stop is adjustable to suit any size segment. It will be observed that there are three T grooves in the board. These permit using the adjustable stops at three angles for 4, 6 or 12 segments to a circle.

The T grooves are overlaid with metal guide strips which are graduated and marked in proportional chord lengths indicating the diameter of the circle. This provides a ready adjustment to accurate segment length. The pin that gages the length of the segment is spring-loaded, so that it can be depressed by the edge of the segment for the initial cut. Sketch C shows this in detail.

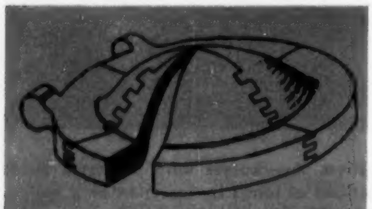


Fig. 4 . . . Multiple spline system of joining segments recommended for dome-shaped construction.

Fig. 5 . . . Stitching board used to cut alternate splines and grooves at ends of pattern segment.

Stitching segments

The third method is a multiple spline system, and the splines are integral with the segment as shown in Sketch C, Fig. 1. This construction is recommended for shapes that fall away rapidly from the perpendicular, such as the dome-shaped cover shown in Fig. 4. If this type of pattern were made up of plain segments, the result would be thin or feathered joints which tend to curl or peel where heavy glue lines are exposed by lathe turning.

The stitching board (Fig. 5) is used to cut the alternate splines and grooves at each end of the segment. When a stitching segment is made it must be remembered that additional length is required to accommodate the stitch. After equal-divisions of a circle are laid out, add one half the kerf depth, at each end of the segment, parallel to radial lines.

Accuracy of layout is essential because unequal spacing causes needless fitting. It is good practice to glue-up half rings first, then parallel the half joints before attempting to make the final stitching cuts.

How to use the jig board

The stitching board (Fig. 5) is flat with tapered pins that slide through cross members. The board is held securely against the fence of the circular saw table by tightening the taper against the back of the fence. A hardwood guide strip projects above the surface of the board. This strip is the same thickness as the saw cut so that the segments will slide freely over it.

After each cut is made, the segment should be drawn back over the saw, without lifting it from the board, to return it to the starting position. This second pass over the saw cleans out the kerf and makes a good fit for gluing up.

▶ *Urge prompt entry in 1953 Annual A.F.S. Apprentice Contest*

Apprentices can enter the 1953 A.F.S. Apprentice Contest until the middle of March. Competition is open in five divisions—metal patternmaking, wood patternmaking, and gray iron, non-ferrous, and steel molding. All interested are urged to enter promptly so their entries will be completed in time for judging.

All apprentices in North America are eligible if they are taking a regular training course of not less than three years duration and are not over 24 years old on the day they prepare their entry. For veterans, the age limit is 24 plus length of their term of service in the armed forces according to Prof. R. W. Schroeder, who heads the Apprentice Contest Committee.

For details on the competition which pays $100, $50, and $25 in prizes in each division, plus round trip rail and Pullman fare between their homes and Chicago for the five first prize winners, write Jos. E. Foster, A.F.S. Headquarters, 616 S. Michigan Ave., Chicago 5, Ill.

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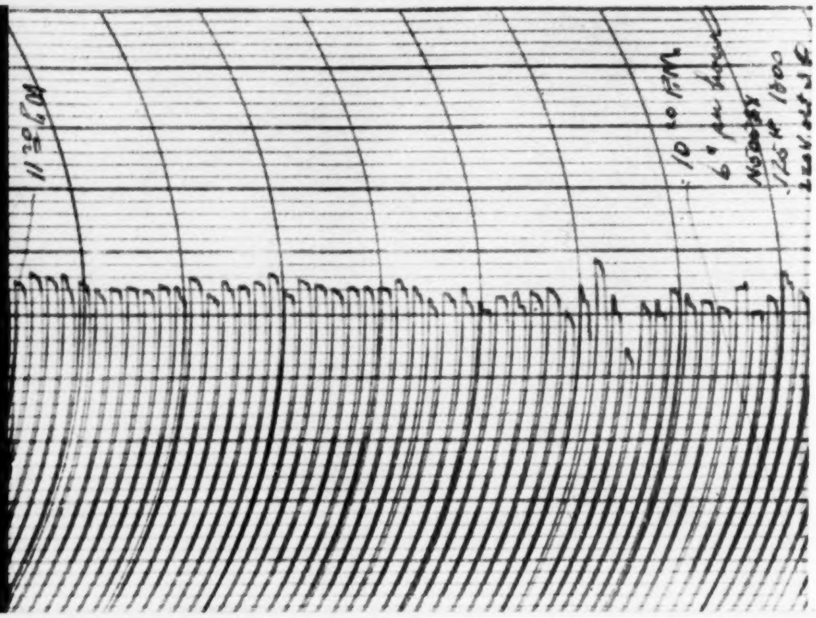

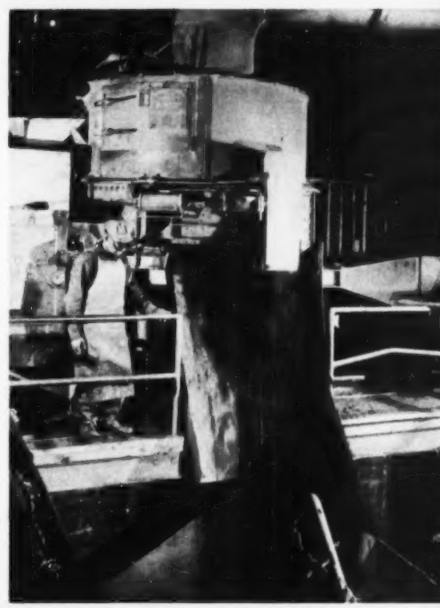

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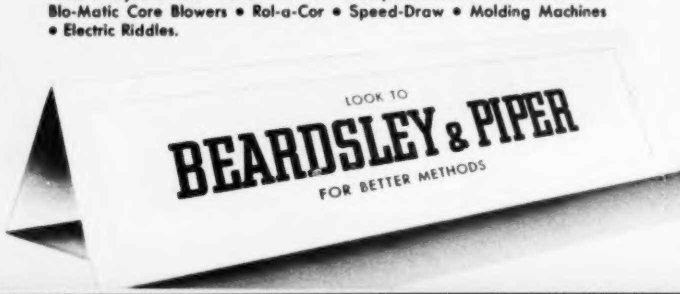


Cupola melting and control for machine tool castings

An outline of the cupola practice which enables one foundry to deliver to its customers what they want in quality machine tool castings, presented at the 1952 Ohio Regional Conference.

A. J. DUBLO / *Metallurgist, Sterling Foundry Co., Wellington, Ohio*

Hot metal and minimum number of transfers are desired in every foundry.

▪ The techniques used for obtaining high-quality castings for making machine tools can be pointed up by outlining the controls used in the Sterling Foundry. While control of other operations is of course important, this analysis will be confined mainly to alloying, melting and handling the metal.

All users of foundry products want castings that conform closely to pattern, have good surface finish, and are correct in chemistry, tensile and transverse strength, and Brinell hardness. Also, castings must be solid throughout and uniformly machinable, with no hard spots, edges or corners. Machine tool castings must have good wear resistance with no galling. And these characteristics must remain uniform from lot to lot, so that machining procedures can be maintained.

Two cupolas are used alternately. One is patched each day for the next day's heat. The cupolas have 78-in. shells and are lined to 54-in. diameter with two layers of Missouri firebrick. Other refractory materials that have been used are Ohio, Kentucky and Illinois firebrick for lining, and Ohio sandstone for patching. For years Missouri firebrick for lining and Ohio sandstone was the accepted practice and worked quite well. Two years ago an air-emplacement gun with a sand, clay and ganister mix was tried. This has proved quite satisfactory. The time required to patch the cupola has been cut to one hour from two, and the ganister patching has held up very well for heats of over 65 tons.

The cupolas have high stacks. Distance from the bottom doors to the charging door opening is about 20 ft. A straight lining with a slight bosh over the tuyeres works better in this operation than the so-called contour lining. An easily replaced metal curved block protects the tuyeres from metal erosion. Since mechanical charging is used, the first five foot area down from the charging door is lined with cast iron, interlocking, curved hollow brick. Each fourth row of iron bricks is bolted to the shell. They give good life. A need exists for a good, cheap, air-setting material to use in the area from the iron bricks down to the melting zone. The ganister mix does not seem to fuse well in the upper areas of the cupola, especially in very thin layers.

Tuyeres adjustable

The tuyeres consist of a single, continuous ring around the stack with eight openings into the wind box. Loose plates are cast to fit in each tuyere so that the area can be changed whenever it is felt that an increased or decreased velocity and penetration is needed. At present the cupolas are operated on a 530-sq in. tuyere area, which is approximately ¼ of the cupola area.

Efforts have been made to deliver the air into each tuyere at the same velocity. Wind gauge measurements have been taken, but equal distribution to all tuyeres over any considerable period of time has been difficult. However, good results have been secured by using a windbox of twice the normal height from which the air is delivered to each tuyere at approximately the same velocity. Baffle plates are installed in the upper half of the windbox to decrease the turbulence. The burn-in around the cupola is fairly uniform, which indicates uniform penetration.

Each of the bottom doors is equipped with an eyebolt so that a charging crane can lift the doors into place. They are held there while posts are set up. This method is quicker and safer than the previous winch-and-chain method.

Regular green molding sand is used for ramming the bottom, which is rammed in the usual way. This sand has five to six per cent moisture, 10 to 12 psi green compression strength, and an A. F. S. fineness

Charge makeup area shows cone-bottom buckets and transfer cars. Cupola is slagged into small cinder pots.

number of 60 to 62. In 10 years of operation there has been only one leak in the bottom, and that was caused by a bad hinge pin.

The slag hole, which is replaced every three or four days, is a commercial block of silicon carbide. The life of a block depends on how efficient the cupola tender is in keeping iron out of the slaghole. A slaghole 1¼ in. in diameter is used and troubles are infrequent.

After the sand bottom is rammed into place, several baskets of selected-size coke are placed in the bottom in wing-shaped channels to distribute the flame. Only a small amount of coke is used, and that is for the purpose of protecting the sand bottom from the falling "prepared coke".

By "prepared coke" is meant that on the day before the heat, about 2/3 of the bed coke is placed in containers outside the cupola, and it is ignited with gas burners early in the morning of the heat. This coke burns while the cupolas are being patched. When the bottom is in, the white-hot coke is dumped in and therefore approximately 2/3 of the bed already is burned properly. This practice saves considerable time and eliminates smoke and fumes which were experienced when wood was used for ignition.

A few minutes before charging time the air blast is turned on and the bed burns until all the tuyeres are bright. The bed is measured and enough coke is put in to bring it to the proper working height, which varies from 48 in. to 63 in. A 58-in. bed is used at present. When all operating factors are good, a 54-in. bed is used with excellent results.

In this rear-slagging operation, the slag is collected in large iron flasks on a small car. When the flasks are full, the cars are rolled down the incline and new flasks put on them. When cool, the slag comes out of the flasks quite easily. The slag could be collected in water, but this is not practical in the present setup.

During the years the cupola was hand-charged, a force of 14 men was required. They began early in the morning and worked throughout the day until the heat was over. The materials had to be short, light and easily handled—such as steel rail which also had uniformity of analysis. Cast scrap had to be broken into easily handled lengths. In hand-charging the maximum weight of any piece of scrap was approximately 60 lb.

Today mechanical charging is used. Heavier, bulkier and cheaper grades of scrap can be utilized. This not only saves money but permits operation when steel rail is unavailable. Cast iron and steel briquets, baled steel scrap, automotive steel of all kinds, and similar types of cast scrap can also be used. Such materials are not practical for hand-charging.

Small charging crew

Charging equipment includes an electromagnet for dropping the materials into a scale hopper. After weighing, the charge is dropped into a cone-bottom bucket. This is rolled under the coke scale and the weighed coke and fluxing materials are dropped on top of the metal charge. The total charge is lifted into the cupola by a small charging crane.

With mechanical charging, a crew of five men does all the work, starting about 20 minutes before the wind is turned on.

All melting materials are under cover, which makes for good morale among workers—especially during the cold snowy months. Coke, core and molding sands, and fluxing materials are stored in large concrete bins in the same yard. Pig irons are segregated according to analyses and the bins are properly marked. Metallics are unloaded into marked bins with an electromagnet; nonmetallics are unloaded with a clamshell bucket. All materials are required to come in open flat-cars.

Coke control

The least understood and least regulated material going into any cupola is coke. Coke is the one item that can make or break the whole cupola operation. There are no rapid and accurate tests for good foundry cokes, but opinion is that it should be hard, dense, and have a fairly high but uniform ignition point. It should be of a size proper for the cupola in which it is to be burned. Low sulphur and ash are to be expected. Cokes from different sources of supply have decided differences in their reactions. But with proper size, good results are obtained from all the suppliers.

When hand-charging a 3½ in.-by-5 in. coke, results were good if it was hard and dense. But with the advent of mechanical charging and unloading, and with the use of all sizes of scrap, a larger coke was necessary. It is possible, of course, that the size of the larger coke is no bigger than the other when it finally gets to the melting zone.

Our carbon pickup varies with the size of the coke, all other conditions being as stable as operations permit. The larger and denser the coke, the greater the carbon pickup seems to be, especially on low-carbon-equivalent irons. There is no trouble getting 3.25 total carbon with an iron that is 75 per cent steel scrap. The chief disadvantage of the smaller coke is the increase in blast pressures. When the charge includes small iron and steel briquets, the pressure may become high enough to prevent the blower from delivering the pounds of air required.

With the analysis of iron used and the number of transfers required, the iron must be melted very hot, 2800 F or above. Each tap is measured with an optical pyrometer and recorded. The pyrometer is accurate enough to be used as a guide for comparing one tap to another in a day's heat. As a result of this need for hot iron, more coke is used than most operations require and more than handbooks call for. It is poor economy to skimp on coke and get dead iron, so the coke-to-iron ratio used is six to one, exclusive of the bed coke.

The bed height is carefully checked, which is an important procedure. If it is too low the metal may become oxidized, carbon pickup may vary from charge to charge, and be less than usual. Metal temperatures will drop during the heat, melting rate may become too fast for the needs of the pouring floors, and the metal will lose its fluidity rapidly. If the bed is too high, melting rate may be too slow and carbon pickup may become excessive. The bed is considered at proper height if a shower of sparks appears from the open taphole in from eight to nine minutes after the air is turned on. This corresponds to drops of metal passing the tuyeres in about six minutes. With a 58-in. bed and a six-to-one coke ratio, the cupolas receive 400 lb air per minute.

With the use of a hard, dense coke of the proper size, with a 58-in. to 60-in. bed, there is no trouble getting 2800 F or above metal from the first tap through the whole heat. But if the coke is small, weak or porous the metal temperatures will be erratic and the chill depths of chill tests will vary widely. Analyses of the chill tests will show erratic total carbons also.

For years the drop coke was hauled out and placed on a dump, for use as heating material only. After having it analyzed for carbon, volatile matter, sulphur and ash, it was found that the only difference from the original coke was in size, with perhaps a little adhering slag. Now it is regular practice to keep this coke in a separate bin and use it up by adding about 10 per cent of it in the regular coke charge. As many as ten consecutive charges with all drop coke showed good results, with no apparent differences in metals or temperatures.

Analyses

Although cupola operation calls for six different analyses, usually only three are used each day. The major part of each day's heat is the so-called high-test iron, which meets the requirements of ordinary quality castings in all section sizes with the exception of resistance to wear without galling. High-test iron usually consists of the following charge: 45 to 55 per cent steel scrap, 20 per cent pig, and 30 to 35 per cent scrap. The pig is regular malleable and silvery pig in proportion to secure the proper silicon. The cast scrap consists of returns, with foreign cast scrap when necessary. The foreign cast scrap comes from all types of scrap machinery and briquetted borings. The knockout men carefully segregate the various types of metal so that each analysis is stored in its own bin.

The return scrap is not sand blasted, therefore a little more fluxing material is required. Five per cent of the coke weight is the yardstick for determining dolomite. Two pounds of soda ash are used per charge. The resulting slag in normal practice is quite fluid, and olive-green to gray-black in color. If it becomes black and continues so for a period of time, the blast may be reduced slightly. If it becomes viscous a little more dolomite or soda ash is added. The color of the slag is closely watched, since it is felt that a black slag indicates oxidizing conditions in the cupola.

Chip salvage

Chips from the cleaning room formerly were sold, but now are put in five-gallon containers (empty paint cans), the tops of which are sealed with molten pig at each pouring station. One such container, which weighs approximately 60 lb, is included in each cupola charge.

All this careful segregation of scrap, selection of pig irons, careful weighing of coke and other materials such as fluxes, and the whole charge in the cupola has one end in view: to get metal of the required analysis and temperature out of the cupola, and to do this consistently. Experience has shown that the charging crew, no matter how well experienced, must be carefully watched and constantly alerted to the importance of accurately weighing all materials. It is useless to calculate each item down to the pound, then have the crane man overweigh by one or two hundred pounds.

Check metal temperature

The first tap is made about 22 minutes after the blast is turned on. The ladles are measured regularly and a small bent piece of metal is hung over the ladle edge to show the cupola tender how much iron to draw. After the first tap, the slag line is used as a guide. Optical pyrometer readings of each tap are taken, and if the metal is cold or temperatures start to drop, adjustments are made in coke, or air, or both. To each tap is added approximately 20 points of 75 per cent ferrosilicon of low aluminum content. At no time does the ferrosilicon addition exceed 25 points, in order to prevent aluminum contamination. If the customer's specifications call for other alloys, they are added at the

Pouring 10,000-lb lathe bed with two ladles in Sterling Foundry Company Shop.

spout. Normal analysis of machine tool castings is: total carbon, 2.85 to 3.15 per cent; silicon, 2.00 to 2.30 per cent; manganese, 0.80 to 0.90 per cent; sulphur, 0.12 per cent maximum; and phosphorus, 0.12 per cent maximum. The physical properties on a 1.2-in. arbitration bar are 40,000 psi tensile, 2500 lb transverse on 18-in. centers, 0.23 in. deflection, Brinell hardness 207 to 269, preferably in the upper ranges. This base iron can easily be alloyed to exceed 50,000 psi tensile strength. It can also be inoculated to give the proper microstructure, hardness and solidness for lathe beds, saddles, carriages and other wear-resisting castings.

The metal is tapped at regular intervals, controlled by: actual time between taps, and by tapping as soon as the metal reaches the slag hole. Regularity of tapping is essential to consistent carbon control from charge to charge.

Watch cupola smoke

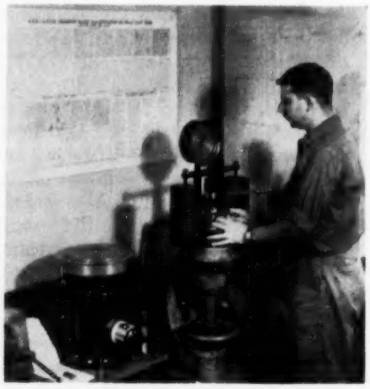
The speed of melting is closely observed, since it is a quick guide to air-and-coke balance. Good results have been observed if at certain definite intervals of time from the start of the heat a certain number of charges have been tapped out. So if the cupola is melting more slowly than usual, and all other factors seem to be normal, there is no hesitancy about increasing the air input. If the metal is melting too rapidly and the slag is darker than normal (or if the metal is sparking at the spout) the air intake is immediately lowered and an extra split of coke added between charges.

The smoke from the cupola stack also is closely watched. When using clean scrap, it has been noted that when the smoke is blue or blue-gray the iron is at its best. When the smoke is dark brown or red-brown, the iron is cold, the chills and carbons are erratic and the metal loses fluidity quite rapidly even if the temperature is good at the spout. When this is observed, the air is lowered in an attempt to raise the bed and an extra split of coke is added. Probably no one would hesitate to increase the coke in order to raise the height of the bed, but since it takes about one hour for the coke to reach the proper place in a cupola, why not use the quicker method? Air change is never great, approximately 10 per cent of the supply.

The next step in metal control is the use of chill tests. Every other tap is sampled with a dip ladle and chills are poured and broken. One half of each chill is saved for the composite sample of the day's heat. The depth of each chill is recorded. It would be more accurate to sample each charge, but accurate enough results can be secured by checking every other charge.

Each type of metal has a definite chill-depth range, and if the chills are abnormal, steps are taken to correct the trouble. Graphitizers or carbide stabilizers are used, depending on the type of deviation.

Some castings, such as V-type saddles, have a tendency to be either open grained or chilled at the edges of the V-ways. A chill test of every charge to be poured into these is taken, and pouring is not done until the proper chill depth is obtained.



The author checking the hardness of a test coupon from a lathe bed.

A record of the chemical analysis of each day's heat of each type of metal is kept and new mixes are based on these reports. The most common deviation is too-high total carbons. A carbon equivalent of 3.65 to 3.90 (3.8 optimum) is maintained, using total carbon plus 1/3 silicon as carbon equivalent. The least amount of trouble from shrinks, blows, misruns and other foundry defects is experienced when the carbon equivalent is 3.75 to 3.85. This range has been consistently maintained over a period of years.

Besides the normal drilling of chills for the daily composite analysis of each type of metal, any chill that deviates markedly from the standard is drilled and analyzed. Thus a constant record is maintained of the day's average and high and low chills. The metal analyses were more uniform with selected scrap and careful placing of materials in the cupola, than they are with the use of bulkier grades.

Receiving ladles, holding approximately four charges, formerly were used in collecting metal from the cupolas (now pouring ladles are hoisted directly to the spout). The receiving ladles did a good job of smoothing out some of the melting variations in carbons and silicons. However it never was possible with the means at hand to preheat the ladles sufficiently to prevent them from chilling the metal too much. With the low-carbon irons and their high freezing points, and all the other metal transfers necessary to our operation, the metal became too cold to pour properly. Experience shows a drop of approximately 100 F for every transfer made. These large ladles will be used again as soon as an economical method of heating them can be worked out. A top-charging electric furnace would make a good collecting reservoir.

Few heats rejected

This description of the cupolas, materials, and melting operations shows what is being done to deliver to the molding floors iron which is hot enough to pour properly and of the proper analysis to give the castings the required chemical, physical and hardness properties, as well as good finish and machineability. As evidence that this is being done and has been done, only one heat of castings out of thousands poured under Navy inspection and specifications was rejected because of faulty physical properties. A very, very few were rejected because of chemical variations. Foundry and machine shop scrap have been kept well below established limits. Of course there have been periods of freak troubles on some castings, but these usually are corrected in a short period of time.

One such period of freak trouble occurred during a coal strike. By-product coke was unavailable, so beehive coke was used for more than three months. We were not accustomed to using it but it was not difficult to get hot iron with coke adjustments. However, carbons were erratic, and shrinks and cracks occurred in castings that formerly had been made successfuly, until we used more pig iron, more coke, and slower melting.

Another factor is the control of so-called tramp elements such as aluminum, lead, antimony, tin and tellurium. Spot analyses for these

are made at regular intervals. It has been shown that many cases of blowholes which occur under the skin of a casting can be traced to aluminum. To avoid this trouble ferrosilicon is kept under 25 points and a low-aluminum type is bought. All scrap is carefully examined to eliminate any non-ferrous metal such as bearings, bushings, etc. A routine analysis for aluminum is made at intervals and spectrographic analyses for the other elements are made occasionally. The exact danger limits on these elements have not been determined, but records are kept which lead to the belief that the elements are very low. However no precautions are overlooked in the way of avoiding them in machine-tool and low-alloy castings such as the austenitic cast irons.

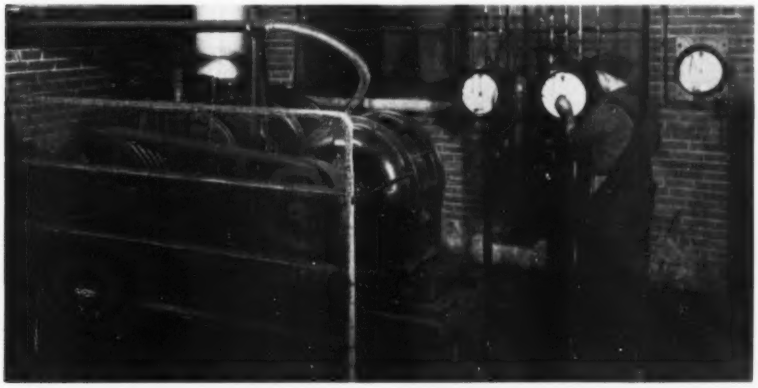
Each morning, and several times during the day, each molding foreman and the metallurgist examine the fractures of the gates and risers in the knockout room and any deviation from the standard is corrected in the next day's heat. Abnormal shrinks and macro-structures call for chemical analysis. All risers are checked for signs of oxidation such as mushrooming.

The cleaning room foreman calls the attention of the metallurgist and the proper foreman to any difficulty in the cleaning room caused by hard or open castings, slag, shrinks, scabs, etc.

A permanent record is kept of each casting scrapped and the reasons for rejection. The proper foreman certifies the type of reject. This is done for both foundry scrap and castings returned from the machine shop. Any defect which seems repetitive calls for a conference and some sort of action on molding, metal, etc. Also, some of our key men visit the machine shop at regular intervals and a full report of any difficulties encountered there is given in writing to the departments responsible.

Sand control, too, is a vital part of our casting control, and as much time is devoted to it as is given to the melting and checking of the iron. A synthetic sand composed of Ohio and Port Crescent sands is used.

Until about 1930, the conventional iron for machine-tool beds, frames, and other sliding members consisted of a high-carbon, low-silicon iron. This was a metal of 3.25 to 3.50 per cent total carbon and 1.00 to 1.25 per cent silicon. When both light and heavy sections were present in the same casting, this conventional iron was unsatisfactory. The heavy section was too open, or the light section was too hard. The addition of nickel in this type of iron was helpful but did not completely solve the problem. Silicon was the variable and little attention was paid to the carbon content of the iron. The narrow range of silicon required and the usual fluctuations in this element made control of this metal difficult for dense castings with a good finish.



Adjusting air weight control chart used to record the air delivered to Sterling's three cupolas by the positive-pressure blower in the foreground.

To offset these difficulties, a high-strength iron was developed, in which carbon was considered the important element to regulate. The iron has total carbon from 2.75 to 3.10 per cent, silicon from 1.85 to 2.30 per cent, and 1.00 to 2.00 per cent nickel. This iron, which is called a low total-carbon, medium-silicon iron is now considered standard. It has a high machinable hardness, excellent finish in heavy sections, and is quite insensitive to section variations. It is an ideal iron for machine tool sections in every respect but one: it has a tendency to score or gall. This trouble did not occur frequently, but it was a problem.

To find the cause of scoring and galling on beds and saddles, sections of the areas where galling occurred were obtained. Sections of machines which wore well were also obtained. In every case of galling or scoring, a microconstituent—called by various names such as primary ferrite, eutectic ferrite, pseudo-eutectic super-cooled or snowball—was found. Primary ferrite was never found in any bed or saddle that did not score or gall. The unetched samples showed graphite in a fine dendritic pattern in those parts that had galled. While the castings that had worn evenly may occasionally have had a little dendritism, the graphite was always in normal flake. Since the primary ferrite was found only in the parts which scored or galled, it was concluded that this was the source of trouble.

Why primary ferrite?

In searching for the cause of the problem, literature brought out these facts: primary ferrite could be caused by 1) too rapid a cooling rate for the composition, or 2) superheating low total-carbon iron. A comparison of these showed that there was low total carbons and plenty of superheat, on which the foundry practice would not permit a change.

That a fully pearlitic matrix, with no primary ferrite present, would give excellent wear resistance was checked with wear tests, which showed conclusively that an iron with primary ferrite wore much faster than a fully pearlitic iron.

It was found that proper inoculation could control the primary ferrite. It was not necessary to eliminate it completely; all that was needed was to keep it within the proper machining limits.

All beds, saddles and carriages have cast with them a test coupon which is attached to the casting but can be easily broken off. Such coupons are of a section size that will cool at approximately the same rate as the parent castings. The coupons are sectioned and a microspecimen as well as a chemical sample is taken. Thus, every bed is examined to see that it has a fully pearlitic matrix with no primary ferrite deeper than the machining limit. A careful record of the chemical analysis and Brinell hardness is kept, along with a brief description of the microstructure.

Review shows S & H & AP progress

Lists contributors to industry-wide program

The American Foundrymen's Society recently completed (last September) the first full year of the current three-year drive for a $350,000 fund to support a 10-year, industry-wide, Safety, Hygiene and Air Pollution program. Herewith is *American Foundryman's* report on the aim of the program, its present status, its current and future projects, and a list of contributors to the S & H & AP fund as of December 23.

▪ In recent years the castings industry has become conscious of an increasing need for proper regulation of its working conditions and of its conduct as a member of the industrial community. This need for an aggressive safety and hygiene program was first referred to the National Castings Council, comprising all the major foundry groups. After careful study, the Council requested A.F.S. to develop such a program.

Reason for this selection, it was pointed out, is that no other foundry organization or group occupies the unique position and status of A.F.S. for technical leadership in the castings industry. The industry's first activity in the field of safety and hygiene was through the medium of The A.F.S. Safety & Hygiene Committee, established in 1936 to combat the then prevalent accent on silicosis. The six "codes" of recommended practices prepared by the committee, the only foundry codes ever established by any group, have been used all over the world and accepted for their engineering data.

Authorized by the A.F.S. Board of Directors, the S & H & AP program was placed under the direction of a steering committee appointed to set the policies and review the work of various special committees —which now comprise committees on safety, dust control and ventilation, air pollution, welding, and noise control.

The Steering Committee is headed by Jas. R. Allen, International Harvester Co., Chicago, who served as chairman of the former S & H Committee and is nationally known for helping to develop the accepted "codes" of recommended practice.

An important step in advancing the program was the appointment on May 1, 1952, of William N. Davis as director of S & H & AP and full-time member of the A.F.S. technical staff. Mr. Davis was formerly a member of the National Safety Council, Chicago, where he was senior engineer and director of the Metal Section.

In demonstration at one of S & H & AP-sponsored training programs, Floyd Van Atta, National Safety Council, Chicago, releases steel ball from electro-magnet for 5-ft free fall onto heat-treated safety lens to determine shatter point.

Set up safety courses

One of Mr. Davis's first activities has been the establishment of foundry safety courses (designed primarily for the supervisory personnel of smaller foundries) and the development of co-sponsored University and A.F.S. seminars on safety, health, and plant-working conditions.

Two such seminars are scheduled for the immediate future—one at the University of Illinois on Feb. 17, 18, 19 (see program on page 59) and another at the University of Wisconsin on March 24, 25.

Guided by the Steering Committee, Director Davis has stepped up the activities of the working committees. In general these committees are devoting their efforts to the following phases of a comprehensive program:

1. The present A.F.S. "codes" of recommended practices are being reviewed and revised, including the general "code" for the protection of foundry workers, issued as an "American Standard" in 1932. In these projects the requirements and needs of both large and small foundries are considered.

2. Recognizing that new problems will constantly arise in a progressive industry, new manuals of recommended practices are being developed—already off the press are *Health Protection in Foundry Practice* and *Symposium on Air Pollution*. Other manuals at various stages of development will treat on (a) woodworking, (b) exhaust systems for electric melting furnaces, (c) a welding code—to include welding and generating plants for acetylene and oxygen, (d) acoustical treating of work areas to minimize noise, (e) control of external air pollution, (f) ventilation requirements for sand-handling systems and shakeouts, (g) ventilation for non-ferrous melting furnaces, and (h) ventilation of the general working area.

3. Literature will be reviewed and leading universities and research institutions visited to determine the voids in present knowledge and the extent of research now being conducted. In this way, S & H & AP research will be guided by practical considerations.

4. An educational program is being developed toward acquainting the castings industry with most recent information and developments,

and toward fostering a greater safety, hygiene and air polution consciousness in foreman, apprentice and student training.

5. Cooperation is being promoted among various professional societies and governmental agencies concerned with safety, hygiene and air pollution problems. The aim is to provide opportunity for expressing the position and accomplishments of the metal casting industry and to further acquaintanceship with the points of view and programs of these groups. (In this regard, attention is called to the McIntyre Research Foundation conference on silicosis which convenes Jan. 26, 27, 28 in the Sherman Hotel, Chicago. Papers of special interest to foundrymen are: "*Pre-placement Examinations*," "*Safety and Personnel in the Steel Foundry*," "*Experiences with Aluminum Therapy*," and "*The Prevention of Experimental Silicosis*." Another meeting which the S & H & AP recommends is the Industrial Ventilation Conference to be held Feb. 16-19 at Michigan State College, East Lansing—see page 93.)

6. Through the committees and staff director, practical answers are being provided for solving individual plant problems of safety, hygiene, and air pollution. It is not intended, however, that this program shall in any way supersede the work of qualified consultants and engineering services, and the extent of the technical service to be provided to the industry will depend on the indicated need. As the program develops and adequate financing is assured, it is anticipated that more direct assistance can be given many foundries in the solution of plant conditions.

As recommended by the Special Committee of the Foundry Industry in 1949, and subsequently endorsed unanimously by the National Castings Council, A.F.S. has undertaken the Safety & Hygiene & Air Pollution Program for a minimum 10-year period. It is estimated that $350,000 (to be raised by June 1954) will be required to adequately finance the work, on a budget of $35,000 per year.

The total funds must be raised by voluntary subscriptions from the castings industry. No Government funds are contemplated, and current operating revenues of A.F.S. and other foundry organizations are insufficient to finance the broad program necessary.

Recognizing the work being done in its own best interests, the castings industry is—without promotional fanfare—beginning to provide the funds required. Substantial donations are being received in increasing numbers—receipts during the first half of December totaled more than $7,000.

All solicitation is carried on by the National Office of A.F.S., by voluntary committees of the industry, and by members of the National Castings Council. To assure continuity of the program, it is urged that all contributions be made (if consistent with company practice) *for the entire 10-year program*, either in a lump sum or pledged over three years.

Checks and pledges should be made payable to American Foundrymen's Society, 616 S. Michigan Ave., Chicago 5, Ill.

FOUNDRY SAFETY, HEALTH AND AIR POLLUTION CONFERENCE

UNIVERSITY OF ILLINOIS—FEBRUARY 17, 18, 19

Conducted jointly by the American Foundrymen's Society and the Department of Mechanical Engineering of the University of Illinois, this three-day conference will be held at the Illini Union Building, Urbana, Ill. The following program will be presented (unless otherwise indicated all sessions—including meals—will be held on the third floor of the Illini Union):

TUESDAY, FEBRUARY 17

9:00 a.m. . . Registration

11:00 a.m. . . FILM: "*The Invisible Shield*"

12:15 p.m. . . LUNCHEON

1:15 p.m. . . "*Safety Practices in the Production of Ductile Iron*," Robert E. Savage, International Nickel Co., New York.

2:00 p.m. . . "*Effects of Resin and Fluorine Fumes in Shell Molding*," Herbert J. Weber, American Brake Shoe Co., Chicago.

3:00 p.m. . . "*Safety Training in the Foundry*," W. N. Davis, A.F.S., Director of Safety, Hygiene and Air Pollution Program.

3:45 p.m. . . Discussion on afternoon papers.

4:00 p.m. . . Visit to Central Foundry Div. of General Motors Corp., Danville, Ill.

4:00 p.m. . . Board busses at Civil Engineering Hall.

5:15 p.m. . . Arrive at Danville, Dinner.

6:00 p.m. . . Plant Visitation.

9:00 p.m. . . Board busses.

10:00 p.m. . . Arrive at Urbana.

10:15 p.m. . . Arrive on Campus.

WEDNESDAY, FEBRUARY 18

8:30 a.m. . . "*Welding Hazards*," W. H. Downing, Lincoln Electric Co., Chicago.

9:15 a.m. . . "*Dermatosis in Foundry Operation*," Dr. F. Vanatta, National Safety Council, Chicago.

10:15 a.m. . . "*Practical Control Methods of Foundry Air Pollution*," Ray Moore, Claude B. Schneible Co.

11:00 a.m. . . "*Introduction to the Noise Problem*," Prof. J. O. Krahenbuehl and Prof. Jas. Leach, University of Illinois, Urbana.

12:15 p.m. . . LUNCHEON SESSION: Dean H. H. Jordan, University of Illinois.

1:15 p.m. . . "*Facts about Silicosis and Siderosis*," L. E. Hamlin, MD, American Brake Shoe Co., Chicago.

2:15 p.m. . . "*Dust and Fume Sampling Methods*," Lynn D. Wilson, Wilson Industrial Hygiene & Research Laboratories, Chicago.

3:30 p.m. . . "*Instruments to Measure Air Pollution—A demonstration of the instruments used by Federal, State and Municipal authorities to Measure Air Pollution*," Nelson W. Hartz, Mine Safety Appliances Co., Pittsburgh, Pa.

6:00 p.m. . . EVENING SESSION. Lincoln-Urbana Hotel (Student chapter to be guests of A.F.S.) Address by I. R. Wagner, National President of A.F.S.

THURSDAY, FEBRUARY 19

8:30 a.m. . . "*Maintenance of Foundry Ventilation Equipment*," K. M. Smith, Caterpillar Tractor Co., Peoria, Ill.

9:15 a.m. . . "*Labeling of Hazardous Materials*," S. C. Rothman, John Deere & Co., Moline, Ill.

10:15 a.m. . . "*Safe Practices in Materials Handling*," G. W. Harper, University of Illinois.

11:00 a.m. . . "*Safe Storage, Handling and Use of Magnesium*,"

12:15 p.m. . . LUNCHEON SESSION. Presentation of Certificates, Dean S. C. Robinson, University of Illinois.

S & H & AP Contributors

The list of contributors through December 23 includes the following companies:

Acme Foundry & Machine Co., Coffeyville, Kan.

Alabama By-Products Corp., Birmingham, Ala.

Alamo Iron Works, San Antonio.

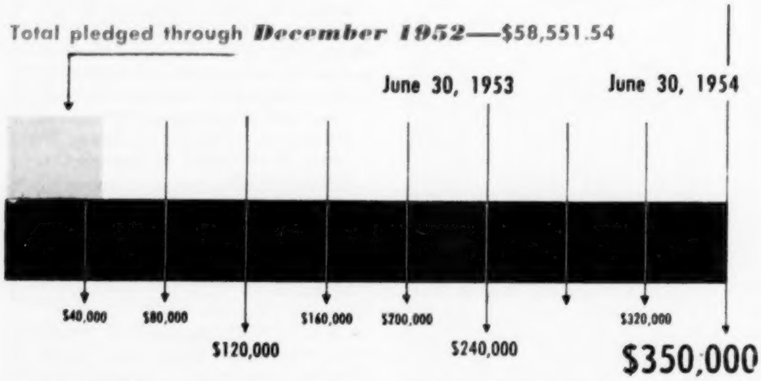
Albion Malleable Iron Co., Albion, Mich.

Allied Steel Castings Co., Harvey, Ill.

Allis-Chalmers Mfg. Co., Milwaukee.
Alloy Cast Steel Co., Marion, Ohio.
Alloy Steel & Metals Co., Los Angeles, Calif.
Alloy Steel Products Co., Bloomfield, N. J.
Altens Foundry & Machine Works, Inc., Lancaster, Ohio.
Aluminum Match Plate Corp., Kenmore, N. Y.
American Air Filter Co., Louisville, Ky.
American Car and Foundry Co., New York.

Beckett Bronze Co., Muncie, Ind.
John H. Best & Sons, Inc., Galva, Ill.
Bignall Co., Medina, N. Y.
Black-Clawson Co., Hamilton, Ohio.
Bonney-Floyd Co., Columbus, Ohio.
Boston Electro Steel Casting, Inc., Boston.
Bound Brook Oil-less Bearing Co., Bound Brook, N. J.
Brillion Iron Works, Inc., Brillion, Wis.
B. F. S. Bronze Co., Brooklyn.
Buckeye Foundry Co., Cincinnati.
Buckeye Steel Castings Co., Columbus, Ohio.

S&H&AP fund goal



American Cast Iron Pipe Co., Birmingham, Ala.
American Chain & Cable Co., Inc., York, Pa.
American Crucible Products Co., Lorain, Ohio.
American Malleable Castings Co., Marion, Ohio.
American Manganese Bronze Co., Philadelphia.
American Skein & Foundry Co., Racine, Wis.
American Steel Foundries, Chicago.
Ampco Metal, Inc., Milwaukee.
Anstice Co., Inc., Rochester, N. Y.
Archer-Daniels-Midland Co., Fdy. Prods. Div., Cleveland.
Armet Alloys, Inc., Cleveland, Ohio.
Arwood Precision Casting Corp., Brooklyn.
T. L. Arzt Foundry Co., Chicago.
Atlas Foundry & Machine Co., Tacoma, Wash.
Badger Malleable & Mfg. Co., South Milwaukee, Wis.
Banner Iron Works, St. Louis.
Barclay Foundry, Inc., Milwaukee.
Bay City Foundry Co., Bay City, Mich.
Beardsley & Piper Div. of Pettibone Mulliken Corp., Chicago.

Builders Iron Foundry, Providence, R. I.
Burnside Steel Foundry Co., Chicago.
Burr Oak Brass & Aluminum Div., The Keyes-Davis Co., Burr Oak, Mich.
Bushings, Inc., Philadelphia.
Cadillac Malleable Iron Co., Cadillac, Mich.
Calumet Steel Castings Corp., Hammond, Ind.
Canton Pattern & Mfg. Co., Canton, Ohio.
Carbon Malleable Casting Co., Inc., Lancaster, Pa.
Edwin S. Carman, Inc., Cleveland, Ohio.
Carondelet Foundry Co., St. Louis.
Central Specialty Div. of King-Seeley Corp., Ypsilanti, Mich.
Chain Belt Co. of Milwaukee, Milwaukee, Wis.
Chemalloy Foundry Co., Louisiana, Mo.
Chicago Heights Brass Foundry, Chicago Heights, Ill.
Chicago Malleable Castings Co., Chicago.
Cincinnati Milling Machine Co., Cincinnati.

Commercial Steel Casting Co., Div. of Osgood Co., Marion, Ohio.
Compton Foundry, Compton, Calif.
Continental Foundry & Machine Co., East Chicago, Ind.
Cooper Alloy Foundry Co., Hillside, N. J.
Crane Co., Chicago.
Crouse-Hinds Co., Syracuse, N. Y.
Crown Cork & Seal Co., Inc., Baltimore, Md.
Curto-Ligonier Co., Ligonier, Ind.
Cutler Hammer, Ind., Fdy. Div., Milwaukee.
Dalton Foundries, Inc., Warsaw, Ind.
Darling Valve & Mfg. Co., Williamsport, Pa.
Dayton Malleable Iron Co., Dayton.
Decatur Casting Co., Decatur, Ind.
Deemer Steel Casting Co., New Castle, Dela.
Deere & Co., Moline, Ill.
Dexter Co., Fairfield, Iowa.
Dixie Bronze Co., Birmingham, Ala.
Dodge Steel Co., Philadelphia.
Duriron Company, Inc., Dayton, Ohio.
East Birmingham Bronze Foundry Co., Birmingham, Ala.
East St. Louis Castings Co., East St. Louis, Ill.
Eastern Malleable Iron Co., Naugatuck, Conn.
Benjamin Eastwood Co., Paterson, N. J.
Eaton Mfg. Co., Detroit.
Electric Steel Castings Co., Indianapolis.
Engineering Castings, Inc., Marshall, Mich.
Falk Corp., Milwaukee, Wis.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Farrell-Cheek Steel Co., Sandusky, Ohio.
Federal Malleable Co., West Allis, Wis.
Florida Machine & Foundry Co., Jacksonville, Fla.
Forest City Foundries Co., Cleveland.
Foundry Facings Manufacturers Assn., Pittsburgh, Pa.
Frank Foundries Corp., Moline, Ill.
Frank Foundries Corp., Davenport, Iowa.
Fulton Foundry & Machine Co., Inc., Cleveland.
General Foundries Co., Milwaukee.
General Malleable Corp., Waukesha, Wis.
Gibson & Kirk Co., Baltimore, Md.
J. E. Gilson Co., Port Washington, Wis.
Gillett & Eaton, Inc., Lake City, Minn.
Goldens' Foundry & Machine Co., Columbus, Ga.

continued on page 91

Automatic fume collection solves air pollution problem

Faced by limitations set up by the Los Angeles County Atmospheric Pollution Code, the Lincoln Foundry Corp. installed equipment designed to reduce emissions from its cupola. This article deals with the problems involved, the equipment design, and the results.

J. E. L'ANSON / *Exec. V. P., Lincoln Foundry Corp., Los Angeles*
T. L. HARSELL, JR. / *Consultant, Hermosa Beach, Calif.*
R. T. PRING / *American Wheelabrator & Equipment Corp., Mishawaka, Ind.*

■ The Lincoln Foundry Corporation, operates a single 78-in. cupola lined to 54 in. Like all foundries in Los Angeles County, it was faced with the necessity of reducing the emissions from its cupola in order to comply with the provisions of Rule 54 (Rules and Regulations of the Los Angeles County Air Pollution Control Dist., amended June 20, 1950).

An extensive research program, sponsored by the Technical Subcommittee of the Gray Iron Smog Committee, had previously indicated that of the various types of equipment available for the suppression of cupola emissions, only the baghouse and the electrostatic precipitator would meet the requirements of Rule 54. These findings were subsequently confirmed by engineers of the Los Angeles County Atmospheric Pollution Control District.

Tried baghouses

Early attempts to adapt cloth filtration to the collection of dust and fume from cupola gases were crude but quite successful. Existing cupola-top washers were utilized for cooling the gases to about 450 F. The baghouses resembled somewhat the "homemade" baghouses used for many years in the non-ferrous smelting industry, operating as pressure units with relatively large diameter filter bags only semi-housed for weather protection. Because of the desirability of operating at temperatures above the range of natural fibers, fiberglas filter bags, treated by several different methods, were used. These bags were hand shaken at intervals to remove the accumulated fume deposit, a process that required manual manipulation of various damper valves and shaker devices. Automatic mechanical shaking was not employed because of the brittleness and poor flex resistance of the glass fibers.

In planning the Lincoln Foundry cupola fume collection system, those involved in the initial phases of the design were resolved that the installation would have to be completely automatic. It was recognized that filter bags fabricated from acrylic fiber, properly pre-shrunk, possessed the temperature resistance and mechanical properties required for mechanical shaking in unfavorable atmospheres.

Table 1 compares operating data of the single cupola as determined by Air Pollution Control District engineers on January 10, 1951, before the installation of corrective equipment and by Harsell on October 8, 1952, after the cupola frame collection system had been in operation for approximately seven months.

Reflect changes

Two significant changes to the cupola are reflected in these figures. The stack was raised 10 ft to accommodate secondary combustion and the side charge door was equipped with a counterweighted baffle to reduce the infiltrated air to 48.5 per cent of the original. The combined effect of these changes may be noted in a reduction in the volume and an increase in average and maximum temperatures of the stack gases. Probably as a result of the decrease

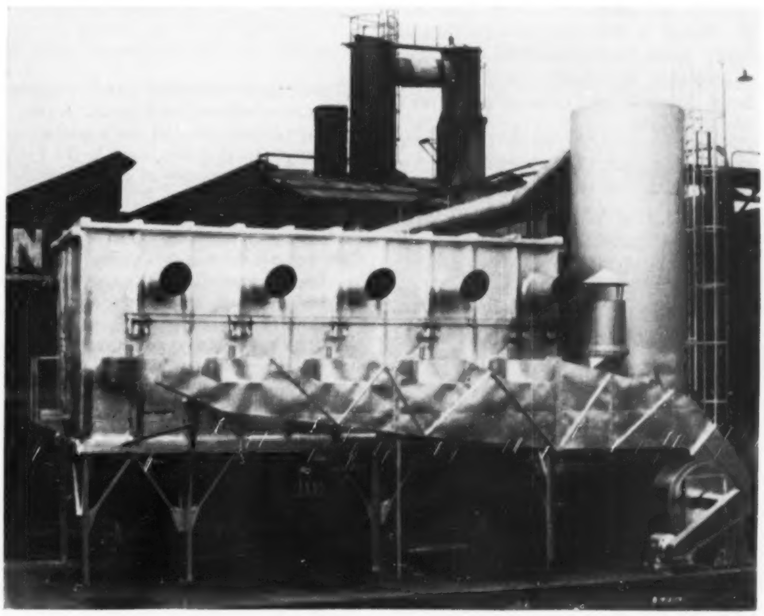


Fig. 1 . . . Cupola fume collection system at Lincoln Foundry Corp., Los Angeles.

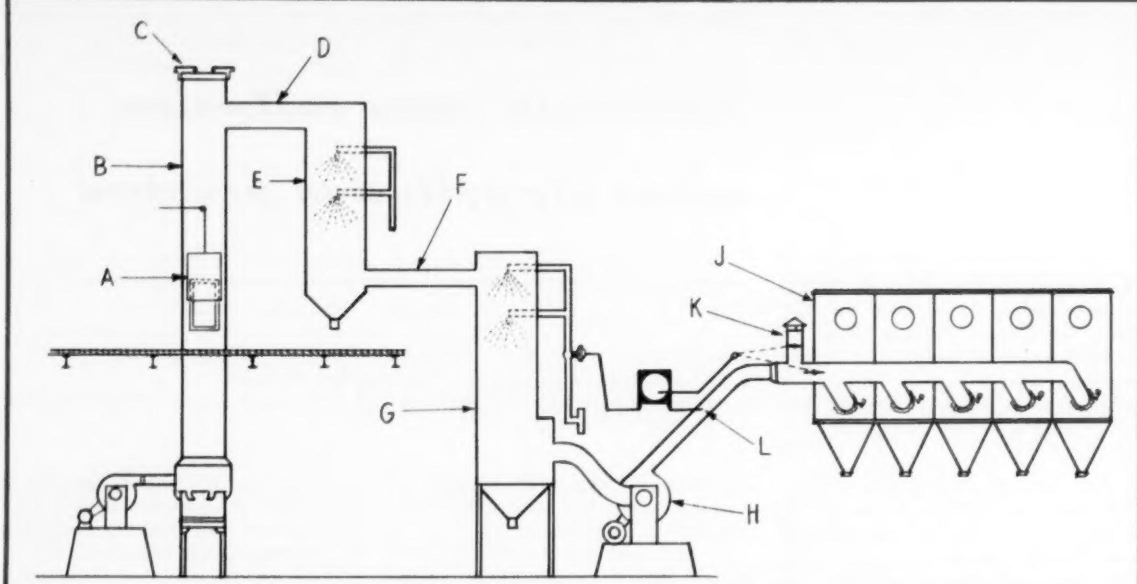


Fig. 2 . . . Schematic diagram of cupola fume collection system. Letters on diagram refer to description in text.

in gas volume, the hourly weight of solids emission (but not the solids concentration) dropped materially.

The total weight of the charge differed in the two tests as did the process weight per hour and the operating cycle. Because of this, the dust loss to atmosphere allowed by law is very slightly higher in the 1952 tests than that previously reported. Please note that during the APCD test in 1951, the average hourly emission of solids was 174 lb. Thus, it was recognized that to meet code requirements, any dust suppressor installed would have to be at least 92 per cent efficient on a weight basis.

Equipment

Figure 1 is a photograph of the operating installation, and Figure 2, a schematic diagram illustrating component parts of the fume collection system.

A refractory lined, counterweighted baffle (A, Fig. 2) was installed at the side charge door to restrict the volume of infiltrating air to 100 per cent of the tuyere air volume. This degree of infiltration provided sufficient air for secondary combustion, but kept the total volume of cupola gases to be cooled and filtered at a reasonable level. The baffle automatically raises and lowers to accommodate the charging skip.

The cupola stack (B) was raised 10 ft to provide a chamber for secondary combustion; and hinged, semi-circular lids (C) were installed to cap the stack. These lids are refractory lined and operated by air cylinders controlled from the charge floor level. A short, stainless steel stub pipe (D) connects the cupola stack directly to the quencher.

The quencher (E) is a carbon steel shell, 6 ft 6 in. in diameter and 32 ft high. It contains 17 spray nozzles controlled by six solenoid valves in such a manner that each set of sprays is either on or off. The quencher is provided with a conical bottom and drain.

From the bottom of the quencher,

TABLE 1 . . . COMPARISON OF DATA BEFORE AND AFTER INSTALLATION

	Without Corrective Equipment 1-10-51	With Equipment 10-8-52
I.D. of cupola at melting zone — inches	54	54
Average volume of stack gases — cfm	51,000	29,000
Average temperature of stack gases — degrees F	1,046	1,580
Volume of stack gases calc. to 60 F — scfm	17,700	7,400
Maximum temperature of gas during burn down — degrees F	1,400	1,790
Height of cupola stack above charge opening — feet	13	23
Dust up cupola stack — grains per scf during charging period	1.15	1.42
Dust loss up cupola stack during charging period — pounds per hour	174	90.3
Area charge opening — square feet	47	22.8
Tuyere air — scfm — 60 F	4,600	4,200
Operating cycle — minutes	320	279
Material charged (2000 lbs. per charge)		
Bed coke — pounds	2,900	3,000
Coke — pounds	10,520	10,560
Metal — pounds	67,390	56,000
Limestone— pounds	2,025	2,480
Briquets — pounds	1,065	1,440
Total	83,900	73,480
Process weight per hour — pounds	15,730	15,800
Dust loss to atmosphere allowed by law — pounds	13.58	13.62

a carbon steel duct (F), varying from 36 in. to 32 in. in diameter extends 100 ft to a secondary cooler (G) 8 ft in diameter and 20 ft high. This cooler contains seven spray nozzles with full modulating water control. Cooled gases pass through an exhauster (H) and into a 5-compartment continuous automatic collector (J). By means of a program timer, each compartment is automatically shut down in turn, the filter bags shaken, and the compartment returned to service. Filtered gas is vented to atmosphere through exhaust ports located high on the wall of the unit. A bypass (K) to atmosphere is located between the fan and collector just after the thermocopule (L) which actuates the secondary temperature control system.

Temperature regulation

In effect, two separate instrumentation setups were used. The quencher sprays are regulated by a temperature controller which provides snap-off control of the six banks of nozzles. Its thermocouple is located near the end of the horizontal duct leading to the secondary cooler. Midway along this duct is a temperature-actuated automatic balanced damper which imposes additional resistance in the line at low temperatures to prevent overload on the fan motor due to increased gas density.

A pneumatic-electric control system provides full modulating control of spray water in the secondary cooler and operates the bypass system in case of an uncontrollable surge in temperature. The baghouse is also bypassed in the event of power or compressed air failures. The thermocouple is located just ahead of the bypass connection so as to permit automatic return of the collector to operation when the need for bypassing ceases.

Cooler design

Because the collectors are operated at a maximum temperature of 275 F, it was recognized that the cooling of the gases was more critical than that required by some other methods of fume suppression. At the time the quencher and secondary cooler were designed, there was little in the literature on spray cooling of gases, and it was necessary to rely on past experience. Since that time, however, certain fundamental relationships governing the behavior of water droplets in hot gases have been worked out and would have influenced cooler design if they had been known at the time.

TABLE 2 . . . GAS VOLUMES AND COOLING SYSTEM PERFORMANCE

	Actual measurements taken 10-8-52
Volume of stack gases calc. to 60 F	7,400
Tuyere air — scfm — 60 F	4,200
Average stack temperature — degrees F	1,600
Maximum stack temperature — degrees F	1,790
Average water consumption in quencher — gpm	28.9
Run off quencher — gpm	5.4
Average water converted to steam — quencher — gpm	23.5
Average water consumption in secondary cooler — gpm	5.01
Run off secondary cooler — gpm	2.11
Average water converted to steam — secondary cooler	2.9
Water pressure at both coolers — psig	120
Temperature, exit of quencher — degrees F	425
Temperature, inlet to secondary cooler — degrees F	415
Temperature, exit of secondary cooler — degrees F	268
Volume entering baghouse @ 275 F — cfm	16,990

TABLE 3 . . . PERFORMANCE OF FUME COLLECTION SYSTEM

	Measured 10-8-52
Gas volume entering filter @ 275 F — cfm	16,990
Square feet of cloth	
with 5 compartments filtering	7,320
with 4 compartments filtering	5,856
Gas-to-cloth ratio	
with 5 compartments filtering	2.3
with 4 compartments filtering	2.9
Shaking cycle, minutes between shaking periods, each compartment	15
Shaking duration, minutes per cycle	1
Gas temperature, degrees F	268
Calculated dew point, degrees F	167
Pressure loss through bags, inches water	
with 5 compartments filtering	5.9
with 4 compartments filtering	6.7
Exhauster motor H.P. rating	40
Average weight dust caught, lbs per hour	
in quencher	31.2
in secondary cooler	6.4
in dust collector	47.3
Total	84.9
Average dust loss in collector exhaust, pounds per hour (thimble test)	0

Table 2 lists data measured on October 8, 1952, showing the performance of the cooling system.

The actual setting of the temperature control points of both coolers may be varied at will, and no difficulty has been experienced in maintaining a safe filtration temperature without condensation in ducts or on inside surfaces of the baghouse. A temperature recorder chart shows temperature regulation from within about 5F from the instant flames broke through the charge at 12:20 p.m. until after the bottom was dropped just before 5:00 p.m.

Run off of water from both coolers, while appreciable, constitutes no problem. It is desirable to have sufficient unevaporated water at the bottom of the quencher to flush out the collected coarse material, although in water-short areas, mechanical sludge ejection may replace hydraulic removal. In the case of secondary coolers, nearly complete evaporation of the spray is desirable and at Lincoln Foundry, improvements in spray nozzles may be expected to further reduce the run off.

Dust collector design

A tuyere air volume of 5000 scfm, plus an estimated 5000 scfm of infiltrated air at the charge door, formed the basis for all gas cooling and volumetric calculations. The greatest variable was, of course, the volume of secondary air entering through

the charge door, and the estimate was based on an entering velocity of 200 fpm through the remaining 22.8 sq ft of charge door opening not closed off by the baffle. Including cooling water vapor, and allowing for heat losses by radiation, the volume of gas to be filtered was estimated at 19,210 cfm at 275 F with a maximum initial gas temperature of 1950 F.

The problem was solved by the installation of a 5-compartment, knocked down type, continuous automatic collector. Each compartment contains 120 dust tubes 5 in. diameter x 112 in. long, providing 1464 sq ft of filtering surface per compartment. Each compartment has a separate inlet baffle chamber, expansion space, electrically operated bag shaking device, air operated cast iron damper valve and hopper. Hinged doors are provided for access to interior compartments. The entire collector is insulated.

Operation of the unit is completely automatic, being controlled by a program timer. A single push button station is the only manual control and is used to start and shut down the entire cupola fume collection system.

The collector is 30 ft long, 10 ft wide, and 22 ft 3 in. high, including the supporting columns. So compact is the equipment that secondary cooler, exhauster, dust collector, and 5 ft x 9 ft 5 in. instrument house are all mounted on a single concrete pad, 26 ft by 58 ft.

Results good

Table 3 lists observed performance of the cupola fume control system after approximately seven months' operation.

For reasons previously explained, the total dust emission is greatly below that measured by the APCD. The actual volume of gas filtered is somewhat less than the design figure because the tuyere and secondary air volumes are somewhat below the estimate, and the maximum observed temperature is nearly 200 F less than the design figure.

The average dust loss in the collector exhaust is given as zero lb per hour, in the table. This value was obtained by a one-hour thimble sample in which 45 cu ft of gas were sampled. Upon completion of the sampling period, no discoloration of the thimble could be detected, and there was no gain in weight on an analytical balance having sensitivity of 1/20 mg. The gas discharged from the collector contains no visible solids during normal operation and no difficulty was experienced in obtaining APCD approval.

Maintenance & costs

Maintenance of the cupola fume collection system is limited to the weekly cleaning of spray nozzles and bi-weekly removal of deposits from fan blades. Ducts remain free from encrusted or settled solids and no corrosion is evident. The condition of the filter bags was studied and found to be excellent seven months after they were placed in service.

Since much of the erection and installation of equipment was done by plant labor, no cost data of value to others who may be contemplating the installation of similar equipment can be quoted. However, it may be stated that the value of the equipment furnished by the collecting system manufacturer was just under $16,000, and the total cost of the installed and operating system was about double that figure. Where the erection is not handled by plant labor, cost may run slightly higher.

▶ *Reasons for excessive dust and fume*

High dust and fume concentrations can be caused by any of the conditions listed below. They were encountered by Herbert J. Weber, chief industrial hygienist, American Brake Shoe Co., Medical Dept., Chicago, in plants, which though trying to practice atmosphere control, were surprised at their lack of complete success. The material was excerpted from his paper entitled "Housekeeping," one of 19 recently published by A. F. S. in the book *Health Protection in Foundry Practice*. The papers were originally presented at a foundry health conference at the University of Michigan. The conditions:

1. Broken or disconnected exhaust hoods.
2. Broken, stuffed, or disconnected exhaust ducts. Once found a workman's overall jammed in the main header of an exhaust system.
3. Blast gates removed or jammed shut.
4. Burned out power ventilators.
5. Reversed fans. A motor burned out on a certain dust collector. The maintenance man installed another and had the motor running backwards.
6. Broken or open windows in the monitor which caused short circuiting of the air to the power ventilator.
7. Loose fan belts causing slippage and loss of suction.
8. Wrong wiring. One foundry bought an industrial vacuum cleaner which was wired for 440 volt current and was operating it on a 220 volt line. This gave them half the rpm and half the suction and they had become convinced that vacuum cleaners are no good.
9. Dirty dust collector bags so clogged that the suction on the exhaust system was reduced to a point where system was inoperative.
10. Torn dust collector bags, so that there was no dust collection at all and most of the contaminant was re-entering the foundry.
11. Main cooler fans directed in such a way as to neutralize the effects of an exhaust hood or so as to blow contaminant all over the foundry.
12. Broken doors on sandblast cabinets.
13. Fresh air intakes covered with debris so that no fresh air could enter the plant.
14. Indiscriminate use of compressed air for cleaning.
15. Weather caps on certain types of power ventilators jammed shut so that the fan could discharge no air.

▶ *Join a national committee and make the most of A.F.S.*

Participation is the path to maximum benefits in any organization and this is particularly true in the American Foundrymen's Society. Probably those who profit most in increased technical knowledge and new ideas are the more than 500 national committee workers who serve on the 133 committees of the Society.

Committee activity is broken down into specific interest and general interest committees. Specific interest committees are grouped into divisions designated Light Metals, Brass & Bronze, Educational, Gray Iron, Malleable, Pattern, Sand, and Steel. General interest committees cover a broad range of activities in which foundrymen who cast any type of metal are interested.

Anyone interested in participating should request additional information from S. C. Massari, Technical Director, American Foundrymen's Society, 616 S. Michigan Ave., Chicago 5, Ill. Phone HArrison 7-8320.

Advantages and limitations of

Olivine molding and core sand

WM. A. SNYDER / *Asst. Prof., M. E. Department, University of Washington*

Interest in olivine as a foundry mold and core material stems from the desire ot find a non-siliceous mineral grain, one approach to the elimination of air-borne silica dust which most foundries handle by means of adequate ventilation, wetting agents, and respirators. Though used commercially in Norwegian foundries, particularly steel shops, olivine has not been extensively tried in the United States. This paper, presented at the 1952 Northwest Regional Foundry Conference, reports its broad application in a university foundry.

Gray iron castings produced in olivine sand molds by University of Washington students. The refractory has also been used for steel and non-ferrous metals.

■ Since late 1950 the University of Washington foundry has operated almost entirely with olivine aggregates. Lone exception is the silica-base cupola patching material. This is carefully stored to prevent contamination of the molding materials.

Applications that have been tested to date and the size of the aggregate used are: very coarse—ladle lining; coarse to medium—heavy iron molds, steel molds, and dry sand cores; medium to fine—iron molds, steel molds, and dry sand cores; fine—iron mold facing, light iron molds, non-ferrous molds, and shell molds; and very fine—mold and core washes.

Properly graded, olivine makes an excellent foundry sand. Medical research indicates that silicosis will not be caused by olivine fines. Its high fusion point leads to lower cleaning costs and smoother castings. Low thermal expansion of olivine reduces scabbing and allows the use of low permeability facing with high permeability backing sand. Due to the high heat absorbing capacity of the material, it has a chill effect which aids in the production of extremely smooth surfaces on light sections. High density of olivine aids in both mechanical molding and shell molding.

Many of the applications tested have not been fully explored; however, good results have been obtained as far as the work has gone. At the present time research is being planned to gain further information about steel molds, dry sand cores, and low permeability facing sands.

Converted to olivine

Work started in June 1950 when the Engineering Experiment Station started investigating the usefulness of olivine as a foundry material. The project was initiated by and is under the supervision of Prof. Gilbert S. Schaller of the Mechanical Engineering Dept. Active research was started in September 1950 by Alfred Nelson, research fellow. After preliminary laboratory testing, all silica sands were removed from the foundry laboratory and by October 15, 1950, the shop was operating on olivine.

The foundry laboratory is equipped like a commercial foundry and can duplicate most commercial processes in the preparation of sand molds and cores. Two sand heaps are maintained, one for the iron floor and one for the non-ferrous floor. The iron sand is mulled and aerated before use. The non-ferrous sand may be prepared in a similar manner using separate mulling equipment or may be only cut and riddled. In usual operation no facing sand is used; when facing is required to facilitate research it is prepared in portable mulling equipment.

The student shop provides an excellent pilot plant to test methods developed in the laboratory. This work does not interfere with the primary function of the student foundry, which is to educate engineering students in the fundamental foundry processes.

Olivine is a solid solution of magnesium ortho-silicate (forsterite) and ferrous ortho-silicate (fayalite). The fusion point of this material will be effected by its composition as has been shown by Bowen and Schainer. The material under study contains approximately 90 per cent forsterite. Impurities that may occur

with olivine will in many cases lower its fusion point.

Olivine has a low, uniform thermal expansion. The heat capacity of olivine appears to be considerably greater than that of silica.

Olivine will react with many materials at elevated temperatures to form compounds with lower fusion points. Silica may react with olivine to form clinoenstatite ($2MgSiO_2$) which softens at about 2650 F. Aluminous materials react to form cordierite ($Mg_2Al_2Si_5O_{18}$) which will fuse at 2670 F.

Denser than silica

Olivine has a hardness of from 6.5 to 7 on the Moh scale and its specific gravity varies from 3.27 to 3.37. Olivine aggregates are 25 per cent heavier than silica aggregates.

The olivine used in the University of Washington foundry was obtained from the Twin Sisters area of the Cascade Mountains which contains the largest and least altered deposit known in the United States. This deposit yields uniform olivine rich in forsterite.

The rock, which occurs as a massive mineral, was delivered to the university laboratories crushed to minus ¼-in. mesh. It was further reduced by roll crushing at the university. To prepare the first material for the iron floor, the crushed material was passed through a 20 mesh screen, the oversize recirculating through the roll crusher. The material proved difficult to crush with the difficulty increasing as the oversize particles approached twenty mesh.

Olivine was also crushed in a hammer mill but its abrasive qualities caused excessive wear in this equipment. Although an organized study of crushing has not been made, our experience indicates that a desirable method of crushing would involve screening to minus 30 mesh after a single pass of the rolls and sending the oversize to a ball mill.

Before the crushed sand was delivered to the foundry floor it was passed through a cascade type fines removal unit. Table 1 shows the screen analysis before and after dedusting. The sand was then prepared for the iron floor by mulling into the aggregate 3 per cent by weight of western bentonite. The aggregate obtained in this manner had too wide a grain distribution and too many grains larger than 50 mesh to suit our needs in the best possible manner. However, it was the only method available to us at that time suitable for preparing large amounts of sand.

Control grain distribution

A dry classifying unit has been designed and is presently in use to obtain close control of the grain distribution. Table 1 shows a typical separation made with this unit. The device may be adjusted to vary the separation and could be constructed to make a greater number of separations. Sand presently in use on our non-ferrous floor is similar to the fine; sand similar to the medium will be introduced on our iron floor in the near future; sand similar to the coarse is used for ladle lining mixtures and for some dry sand core work. Material taken from the dust collector of this unit has been used for a mold and core wash.

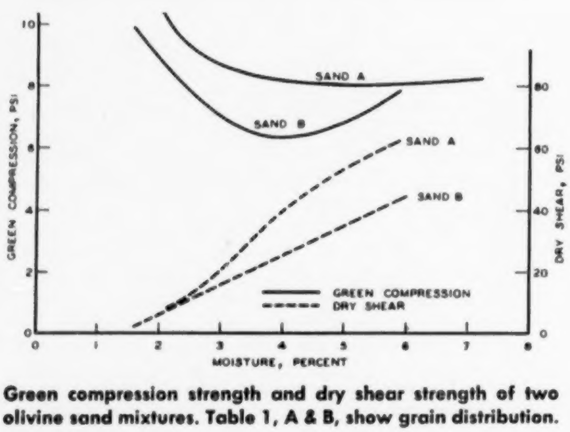
Fortunately, olivine crushes into a nearly equiaxed grain with few slivers and plate-like particles present. Examination of the grains under a microscope shows that all grains are angular. The coarse grains 20, 30, and 40 mesh, show ridges and projections in addition to corners. Medium grains, 50 through 100 mesh appear to be of better shape with fewer projections visible. Grains smaller than 100 mesh resemble in shape the grains found in low permeability natural molding sands.

Very little fusion

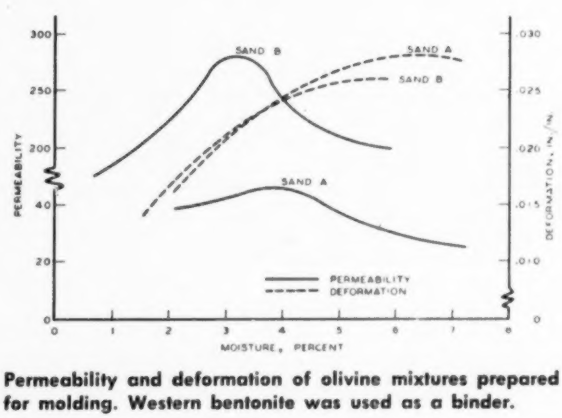
The loss of sand grains due to fusion has been virtually nonexistent. Hundreds of castings have been made in molds produced from heap sand without facing and only one case of sand fusion has been observed. In this instance two small areas of fused sand were found on a steel casting. Since other steel castings had been produced from the same sand without difficulty, it has been assumed that the fused condition resulted from a reaction between the olivine and silicious slag that may have entered the mold from the ladle.

No instances of grain shattering due to thermal shock have been observed although the sand from the interface of many molds has been studied under the microscope. This quality of the sand grain seems to reduce the dust concentration at shake out.

Breakdown of the angular grain during mulling was expected. The degree and type of breakdown were important in determining the usefulness of the material. In the laboratory, new sand grains were subjected



Green compression strength and dry shear strength of two olivine sand mixtures. Table 1, A & B, show grain distribution.



Permeability and deformation of olivine mixtures prepared for molding. Western bentonite was used as a binder.

TABLE 1 . . . SCREEN ANALYSES OF OLIVINE SANDS USED IN UNIVERSITY OF WASHINGTON FOUNDRY LABORATORY

U.S. Screen No.	Iron Heap Sand		Dry Classifier			Molding Sand	
	Before dedust	After dedust	Fine	Medium	Coarse	A	B
12	...	...	...	...	...	...	...
20	0.2	0.4	...	Tr	5.4	Tr	4.2
30	12.7	23.2	Tr	0.6	27.7	2.4	12.6
40	25.5	36.4	0.8	5.6	41.0	4.9	19.6
50	17.3	18.1	Tr	21.2	20.5	8.6	23.4
70	11.3	8.5	3.4	34.2	4.8	10.7	24.4
100	9.2	4.6	6.3	28.9	0.6	11.0	10.6
140	7.6	3.2	21.0	8.1	Tr	12.9	3.3
200	6.8	2.0	21.4	0.6	Tr	16.0	Tr
270	2.9	0.9	8.6	Tr	Tr	9.2	1.9
Pan	6.5	2.7	32.2	0.8	Tr	24.2	Tr

to dry, wet, and cushioned mulling tests. Large grains showed a rapid breakdown; but as mulling time increased the breakdown assignable to each added time increment decreased. Examination showed that the change in screen analysis was due for the most part to the "smoothing up" of the grains. Ridges and projections were removed and the fines content of the sand was increased. As the grains approached a sub-angular shape they became very stable. It is not possible to state that no fracturing of grains occurred but none was noted on microscopic examination.

Wet mulling

Rate of breakdown was greatly reduced by wet mulling. It must be assumed however that the total breakdown in wet mulling would in time approximately equal that of dry mulling. The rate of breakdown was further reduced when the sand was cushioned by adding clay and water at the beginning of the mixing cycle. Medium sand grains showed much less breakdown and grains finer than 100 mesh showed almost none.

The long term test carried out in the foundry will interest the practical foundryman. The original iron heap sand was used to prepare molds for approximately twenty cupola heats with no additions other than temper moisture. The original sand was properly tempered with 3 per cent moisture. It had a permeability of 120 and a green compression strength of 7 psi. At the conclusion of the test the permeability had dropped to 60 and the green strength had risen to 12 psi. The moisture content for best workability at this time was 3.5 per cent and in this condition the green strength was 15 psi. The dry strength of the original heap sand was extremely high, making shakeout difficult. At the end of the test the dry strength had been reduced enough to give a satisfactory shakeout condition. Examination of the grains showed that the larger particles had become sub-angular.

Experience with the original iron heap sand proved that while a satisfactory molding sand for iron and light steel could be obtained by crushing and screening out the oversize, the grain distribution that resulted was not particularly desirable. Superior results are obtained if the aggregates are suitably selected. A dry classifying operation would not add materially to the cost of the crushed aggregate and the benefits would be worth many times that added increment.

Many tests have been made using selected aggregates that have produced molding sands with permeabilities ranging from 10 to 550. Clay contents varying from 1 to 4 per cent have produced satisfactory workability and strength. Graphs on the facing page show properties of two of the aggregates tested. Table 1 (A and B) gives the analysis of the aggregates. In the tests shown, each aggregate was mulled with 4 per cent western bentonite and tested with varying moisture contents.

This was accomplished by mixing originally to the highest moisture content in the sand mill. After the first series of tests the sand was spread in pans and allowed to dry naturally. After a given time interval, the sands were hand rubbed to uniformity and retested. In each case the sand that had been prepared into test specimens was discarded. Sand A proved to be an excellent sand for green sand molding and sand B gave good results when the molds prepared from it were washed and skin dried.

The combinations of properties that can be obtained from selected crushed aggregate without the addition of flour or fines seem almost unlimited.

The high fusion point of olivine does not insure that castings will have a satisfactory surface or will clean readily. When casting gray iron, no fused or sintered barrier layer is formed at the mold-metal interface; thus the metal is not hindered in attempting to penetrate around the surface grains. In the early stages of our investigation some rough castings were produced in olivine sands. The castings carried "burned on" sand that made cleaning difficult. The sand grains were not sintered to the surface of the metal but were held mechanically to the casting. The castings were the result of poor flow properties which in turn resulted from a wide grain spread with an excess of large grains. The same sand rammed to sufficient mold face hardness produced smooth, easily cleaned castings. A similar result may be obtained by using a more suitable aggregate with moderate or light ramming. Visual examination of compression specimens prepared in the standard manner has been more useful in predicting casting surface than flowability tests.

Mold washes effective

Mold washes prepared from olivine fines have provided easily cleaned castings from molds of high permeability sands. The introduction of organic materials into the sand to provide a carbonaceous atmosphere has also yielded clean castings from high permeability molds.

An interesting development is the use of a thin, low permeability facing sand layer with a high permeability backing sand. Exceptionally smooth and accurate gray iron castings have been obtained using a layer of facing sand 1/4 to 1/2 in. thick with a permeability of 10, backed up by sand with a permeability of 150. Iron castings produced in this manner are lifted from the mold with no sand clinging to them and require no more cleaning than a smooth, well made aluminum alloy casting.

Molding sand for brass and aluminum has been produced by adding

4 per cent southern bentonite to a fine olivine aggregate. In preparing the aggregate for this sand, all grains larger than 100 mesh and part of the fines were removed. The resulting sand has a permeability of 10 to 15 and is properly tempered with 3½ to 4 per cent moisture. This sand rammed to a moderately hard mold surface, exerts a slight chill effect which produces an extremely smooth surface. In most respects the sand is superior to any natural molding sand that has been used on our non-ferrous floor in recent years.

Very little research work has been done on the production and properties of dry sand cores made from olivine sands. All dry sand cores used in our foundry in the past two years however have been produced from this material and as a result of this experience a few general statements can be made about its use.

Due to the shape of the grain, more core binder is required to give a suitable dry strength than if a round grain were used. A core mix prepared from a coarse grain with an oil bond requires more oil if mixed in a wheel and plow sand mill than if mixed by hand. This indicates that a paddle type mixer would be preferred for this application. The green strength of the core mix is much higher than would be obtained with a round grain aggregate and the oil consumption is no greater than it would be if a similar strength were obtained by adding silica flour to a more conventional core sand. Oil mixes prepared with finer aggregate, and core mixes containing corn flour or other bonds which will act as cushioning agents, may be prepared in a wheel and plow sand mill.

Slows core baking

The high heat absorbing capacity of olivine, which is beneficial in producing smooth castings, is slightly detrimental in the production of cores. The baking time and burn out rate are both affected by this property and special consideration should be given to the selection of core binders because of it.

The work that has been done at the University of Washington has followed the procedure of crushing olivine, then screening and classifying this material into various grain size groups. These groups have been tested in various foundry applications suitable to their grain size. Three factors have dictated this procedure. First, although the material could be crushed and screened of oversize particles and used directly as a foundry aggregate, it would not be used to its best advantage. Second, the cost of the material would be increased if only a portion of the crushed material were selected and used. The third consideration involves only those foundries that require a sand of extremely high fusion point. This consideration centers around the fact that silica contamination will lower the fusion point of olivine. These foundries would be wise to use olivine for all possible aggregate applications to reduce the possibility of such contamination.

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now, there's an idea!

Practical ideas, developed and proved in foundries and pattern shops, are presented in this column. *Now, there's an idea!* helps American Foundryman readers promote the exchange of ideas, the motivating force behind the American Foundrymen's Society. Contributions for publication are solicited. They may be of any length, preferably short, preferably illustrated by photo or sketch.

▪ Whenever the link chain connecting buckets of the charging unit in one of Allis-Chalmers (Milwaukee) foundries required tightening, it took two maintenance men from one to two hours to complete the job during which time charging was halted.

To prevent this loss of down-time, Charles Richards, a cupola tender, suggested that the solid link between the two transfer cars be made adjustable by welding an extension arm to one of the cars. This arm was then drilled in several positions for holding a locking pin.

Now when the drive chain loosens because of stretching and wear in the links, the extra play can be quickly eliminated by means of the adjustable connecting bar. Naturally, links will eventually have to be taken from the chain, or new links added, but such work is now postponed until a time when it does not interfere with production.

Foundry worker adjusting linkage between cupola charge transfer cars at Allis-Chalmers. Quick adjustment eliminates down time previously encountered.

Shop talk

Practical questions and answers

▶ Mechanical chaplet setting

Are there any companies that manufacture mechanical chaplet setting equipment, preferably of the type that could be used in the making of cast iron radiation?

A machine for setting chaplets has been invented by C. G. Raible of Fanner Mfg. Co., Cleveland, and patent No. 1,796,665, dated March 17, 1931, has been issued. The apparatus consists of a frame on wheels which can be moved over the drag to position the equipment. A series of tracks (horizontal at the lower end) of rectangular cross section and slotted on the under side hold the chaplets by the head with the stem down and feed them into position from the inclined portion of the tracks. The chaplets are transferred mechanically from the ends of the tracks to the mold.

▶ Copper vs nickel

What are the relative values of copper and nickel as alloys in cast iron? Are they interchangeable?

Nickel and copper are somewhat similar chemically and metallurgically. Both, for instance, go through the cupola without loss because their oxides are reduced by iron. Nickel and copper form a continuous series of solid solutions and are so close in crystal lattice dimension that one can build up a ball by plating with alternate layers of copper and nickel, hold it at an elevated temperature a while, and the result will be a copper-nickel alloy ball of uniform composition.

Nickel and copper behave somewhat similarly in cast iron. Chill is restrained by both elements, nickel being the stronger in this respect. Chill restraining effect of nickel in the range commonly used in pearlitic irons (0.10-3.00) is about ½ that of silicon. For copper in the range 0.50-3.50, the affect is about ⅓ that of silicon. Both copper and nickel mildly decrease carbide stability at high temperatures, mildly refine graphite structure, mildly decrease combined carbon in pearlite and, in general, refine and harden pearlite. The effects of these alloying elements on the mechanical properties of cast irons are a direct reflection of their influence on microstructure.

▶ Causes of scrap

I am running out of excuses for scrap castings. Do you know any new ones I can try on the boss?

The 1952 Programme Book, A.F.S. Fourth All-Canadian Conference, lists the following excuses for a bad casting: Rotten sand . . . bum facing . . . dull iron . . . dirty iron . . . flask burned out . . . dog walked across mold . . . plumbago no good . . . rat went down riser . . . iron ran down rat hole . . . laborer knocked off clamp . . . bars in cope loose . . . hard iron . . . too much kish in iron . . . cores too hard . . . no vent in cores . . . too much flour in cores . . . boy didn't skim iron . . . boss didn't give me enough iron . . . boss didn't tell me . . . iron came too late . . . iron came too soon . . . chaplet blew . . . couldn't get hold-up . . . partner wouldn't look under . . . wind blew dirt down riser . . . shop too dark . . . shop too light . . . laborer fell over mold . . . core blew up . . . cross-eyed cat ran over mold . . . blue Monday jinx . . . hole in bottom board . . apprentice stepped on mold . . . no gaggers in shop . . . swab pot fell over on mold . . . pattern was warped . . . pattern was made wrong . . . boss didn't tell me to cut gate . . . iron too kickey.

Blast furnace bell cast by Bethlehem Steel Co., Bethlehem, Pa., weighs 26 tons and has an outside diameter of over 16 ft. Bell has been rough machined and balancing blocks have been welded to the inside surface.

▶ Green sand cores

We experience a lot of difficulty in making cores for cast iron tees and tapers, particularly for the heavier sizes. These cores are strickled on pipes covered with straw ropes. The loam sand used is a mixture of black floor sand, clay and cow dung. These cores prove costly especially in tapers like 6 in. x 3 in., 8 in. x 3 in., 12 in. x 4 in. and greater. Also we get heavy rejections due to core lifts, particularly as a result of quick burning away of the straw backing.

We make all our cores in boxes that are booked together. A cast iron arbor is placed in the drag half only. The method is described in the A.F.S. publication *Modern Core Practices and Theories*, as follows: A core arbor is used to support the core. In small cores, such as 4-in. pipe, a steel pipe with drilled vent holes is used for an arbor. To allow for shrinkage, to make it easier to remove the core, and to aid the venting of the core, hay rope is first wound around the arbor, then the loam is applied. The cores are formed horizontally. To allow for the hay rope and loam, the arbor is from 1½ to 3 in. less in diameter than the core. The thicker the casting, the more loam is required. A special type paper can take the place of the hay rope. After wrapping the arbor with paper or hay rope the first coat of

loam is applied, which is allowed to dry before applying the second coat. The finishing stage is the application of blacking coat.

FRANK W. LANE, JR.
Sand Control Eng.
Stockham Valves & Fittings.
Birmingham, Ala.

▶ Hold machining dimensions

One of our customers reports difficulty in holding dimensions in machining. We make cylindrical castings for them of 2 to 5-in. diameter and lengths of 3-5 in. The cupola iron contains approximately 3.06 per cent carbon, 2.45 silicon, 0.70 silicon, 0.70 manganese, and 0.20 to 0.30 phosphorus. At various locations on the castings, both the outside and inside diameters are turned on a lathe. The customer claims that when the castings are checked the day after machining, the dimensions are different than when they leave the machine. We would like to know to what extent creep or distortion is found in castings of this size.

Another problem is surface grinding of the bolt flange or face of pump castings. These castings are ground dry and possibly get too hot during the grinding. They come off the machine to size but when checked the next day they have warped.

When machining or grinding is done on a casting which contains internal stresses, part of these stresses are relieved so that those remaining cause a dimensional change in the finished casting. Such dimensional changes will usually take place comparatively soon after the machining is done but actually extend over a considerable period, progressively causing more and more distortion.

The answer is to stress relieve the castings by heat treating the castings before shipment. Heat treatment must be done carefully to avoid decreasing the mechanical properties of the metal and casting through decomposition of combined carbon. The castings should be slowly heated to a temperature not to exceed at any time 1,000 F. Hold this temperature long enough to insure uniform temperature in all parts of the casting (usually one hour per inch of thickness). Follow by slow cooling to approximately 400 to 450 F.

Heat treat a trial batch and ask your customer to keep a dimensional record during and after machining. as a guide in determining the exact heat treatment required for proper stress relief.

▶ *Melting non-ferrous turnings*

▪ National Foundry Association questionnaires sent to 125 non-ferrous foundries on remelting of turnings and borings brought a return of 109. Of these, 78 companies do not remelt. Of the 31 foundries that do, 27 reported good results. Nine melt borings in addition to those melted with regular ingots and gates; 21 produced castings where tightness under pressure is required; 7 use the services of metallurgical engineers.

A number of the 78 companies that do not remelt gave reasons. The principal reason was that they had sad experience with such practice. Several said that they returned borings and turnings to the ingot supplier or sold them as scrap. Others reported there was too much danger of getting impurities into finished pressure type castings. One remelts lead, tin, and cadmium base alloys. Others mentioned such factors as too much labor and melting loss, mixed analyses, porous castings caused by oily borings, and too much slag.

Comment varied

Comment from the remelt foundries varied. From 10 percent to 50 percent borings and turnings were used with each heat, several replied. "If clean and uncontaminated," "from castings only," "red brass but not yellow brass," were other reports. One foundry remelts all turnings except oily SAE 62.

The second question was, "Do you melt borings in addition to those melted with your regular ingots and gates? If so, what methods do you use?"

Of the 31 companies that remelt, nine commented on this question. One uses a 25,000-lb reverberatory furnace; a heel of analysis similar to the borings is made, then the borings are washed into the molten metal. After these are melted down, analyses are taken and the composition is adjusted to the analysis desired. Several cast the remelt into ingots from rotary furnaces, then make chemical analyses. Another adds borings to the furnace until the pot is about full, then adds lead, tin, zinc and flux to bring the metal back to usable condition. Two foundries charge borings 50 - 50 with heavy scrap. One operator forms a puddle of molten metal from gates and sprues, then works in the turnings.

Of the remelt foundries, 21 reported they produced castings where tightness under pressure is a requirement. Comment: some foundries remelt some alloys—others in some cases—with some the remelt must pass X-ray inspection for soundness.

Good results were reported by 27 of the remelt foundries. Four reported remelting practice entirely satisfactory. Two said it was good if properly handled. Two add lead or zinc to replace burned out material. Metal analysis must be watched, according to one foundry. Another gets good results from dry borings and turnings.

Unfavorable reports

On the unfavorable side, one foundry has a large metal loss when trying to melt a very large amount of light turnings. Another experiences 50 to 75 percent bad results when melting turnings and believes this is due to contamination by Al, Mn, Pb, P, Fe and others (for example, Si in minute quantities will affect the grain structure of metal where Pb or Sn is present).

As to the utilization of consulting metallurgical engineers, 22 of the remelt foundries answered "No." Several used service engineers, or had their own metallurgists. Those who did employ consultants did so for such reasons as: chemical and physical analysis when required, to check analysis of melted turnings after they have been pigged, for technical information on certain alloys, to find out latest developments, and to get out of trouble. Of the foundries which do not remelt, six reported that they utilize services of consulting metallurgical engineers for all purposes, two occasionally for analysis purposes, three have their own metallurgists, and two get help from the metal suppliers.

▶ Wanted—Used Copies Vol. 52, 56 & 58, Transactions of A.F.S.

A.F.S. National Office is buying used copies of *Transactions* (Vol. 52, 1944; Vol. 56, 1948 & Vol. 58, 1950) at $2.50 each.

Demand for back issues is occasioned by new members coming into the society. Those turning in their volumes will be doing a service to these foundrymen.

Copies in good condition should be sent to American Foundrymen's Society, 616 S. Michigan, Chicago 5.

New airless blast tumbling barrel

Cuts costs, speeds cleaning at Gisholt

W. I. GLADFELTER / *Chief Engineer, Pangborn Corp., Hagerstown, Md.*

A new design, this airless blast machine was exhibited for the first time at the A.F.S. Convention in 1952. This article shows results secured with it at a plant making machine tools.

■ In addition to producing a higher quality of cleaning on castings in less time, the new airless blast tumbling barrel installed at Gisholt Machine Co., Madison, Wis., has improved plant housekeeping and substantially reduced labor costs, power costs and floor space requirements.

The company formerly cleaned its castings in three tumbling mills. Now, one 12 cu ft capacity airless blast barrel does the job more effectively and at lower cost. It operates through two 8-hour shifts per day and is averaging 10 loads an hour. Each load carries from 1000 to 1500 lb of gray iron castings, depending on the type and size. This makes an average total of 12,500 lb per hour.

Labor costs were immediately reduced 33½ per cent with the installation of this machine. The tumbling operation required three workers; the blast cleaning requires only two.

Gisholt's quality requirements are very high. It is their aim to produce painted finishes on their machine tools equal to those on automotive bodies. The airless blast barrel meets these quality requirements by providing a better finish than was obtainable by tumbling. In addition, the new method of cleaning causes no break-down of the sharp corners and edges of the castings.

Operating costs of the barrel are substantially lower than the three tumbling mills. Power requirements are lower because the barrel needs less horsepower to operate—23 hp as compared with 54 hp for the three tumbling mills. This represents a 57 per cent reduction in electrical power consumption. Another saving results from the fact that the new barrel takes only a fraction of the time required to clean the same amount of castings in the tumbling mill.

The saving in floor space has also been appreciable. An area amounting to 210 sq ft, required for the tumbling mills, was released.

The machine cleans a wide range of gray iron castings used in the manufacture of Gisholt's line of machine tools—which are turret lathes, automatic chucking machines, precision balancing machines, etc. These castings range in size from ½ lb to 125 lb each.

Operator effort is reduced to a

The design of the work carrying slats keeps wire or chill nails out of the chain drive, prevents pinched work.

Gray iron castings to be cleaned are loaded into the airless blast barrel machine by means of a work loader which is activated by push-button controls.

General view showing construction of cable-actuated loader and dust collector hopper together with its connection to the abrasive separator at the top of the unit.

minimum in handling the barrel. Castings are loaded into the machine by a push-button controlled work-loader. When the barrel is operating, the work-carrying conveyor travels upward to tumble the castings under the abrasive blast. After the cleaning operation, direction of the conveyor is reversed and the load is automatically dumped into a tote box.

The design of the machine makes for economy in the use of abrasives, and provides high operator safety. Its abrasive-tight door keeps abrasives in the machine during operation, thus preventing waste and avoiding possible harm to the operators. The door is woven steel wire backed with vulcanized rubber. It slides on rollers in a mechanized labyrinth and rolls up compactly out of the way when it is opened, permitting easy access to the cleaning chamber.

Gisholt uses G-25 malleable grit to clean these castings. During operation, the cleaning and reclaiming system of the unit is constantly removing sand and debris from the abrasive. A rotary scalper wheel first removes large fragments while the abrasive drops through a screen to the bottom of the unit. From here, it is conveyed to the top of the machine where a separator draws out the spent abrasives and sand for discard. Good abrasive drops down to a storage container to be used again. The volume of abrasive flow is controlled by an orifice plate.

Plant housekeeping has been improved by the installation of a dust collecting unit that insures a dust-free working atmosphere.

▶ *Another foundryman makes debut as bard*

Some months ago American Foundryman introduced Bill Walkins to its readers as "the bard of the foundry" by presenting one of his poems. Readers liked Bill's homely stanzas which he says were simply "Rammed up and Poured"—title of a book full of them published by his company—The Electric Steel Foundry Co., Portland.

Since presenting Bill's verses, American Foundryman is discovering that there are other bards in the bailiwick—for instance, Lynford Roberts of the Combined Supply and Equipment Co., Inc., Buffalo.

Inspired perhaps by Bill's efforts, Lyn Roberts tossed off a few lines about A.F.S. which were presented first in the *Sound Caster*, a periodical published by the Western New York Chapter of which Lyn is membership chairman. Here 'tis—along with another of Bill's:

To A.F.S.

In foundry progress through past years,
There has been joy, but many tears.
By trial and error, things improved;
Progress was forward, and castings moved.
Each man would, his ideas try,
But keep them from another' eye.
Then came the A.F.S. a happy sight;
To help us in our wandering plight.
They collected papers and help galore,
Continued to offer more and more.
Members joined, anxious to learn;
New methods accepted, never spurned;
They helped to make our labors light.
New members still add to our might.
We offer the A.F.S.—and so,
Members are needed to make it go.
Let's keep the joy and discard the tears,
Keep A.F.S. through future years.

Lyn Roberts

End Of Day

At nightfall, when I hasten
From the foundry's toil and strife,
To that home across the river
Where the ever loving wife
Has chicken pie for supper,
I know that she will say,
"I've prepared your favorite dishes, dear,
For you've worked hard today."
A block from home the kiddies
And the dog all run to meet me
And at home the wife is sitting
In the doorway, there to greet me.
In her fresh, clean dress and apron
She's as pretty as can be,
With a rose among her tresses.
And the baby on her knee.
As she sits there—what a picture!
An artist couldn't paint it!
With outstretched hand she murmurs softly,
"Where's the check? It's pay day, ain't it?"

Bill Walkins

Lynford C. Roberts . . . foundry bard.

news

of technical committees

Committee meetings

Dec. 5—Light Metals Research Committee, A.F.S. Headquarters.
Dec. 8—Foundry Cost Committee, A.F.S. Headquarters.
Dec. 12—Cast Metals Handbook Revision Committee, A.F.S. Headquarters.
Jan. 8—Publications Committee, Congress Hotel, Chicago.
Jan. 9—Sand Program & Papers Committee, A.F.S. Headquarters.
Jan. 16—Steel Research Committee, Morrison Hotel, Chicago.

Elections and appointments

R. H. Olmsted, Whitehead Brothers Co., Conneaut, Ohio, was elected chairman of the Sand Shop Course Committee, A.F.S., replacing R. H. Jacoby, Key Co., East St. Louis, Ill., who had acted in that capacity for the past three years. Fred E. Kurtz, Electric Steel Castings Co., Indianapolis, Ind., is a new member of the committee.

John G. Mezoff, Alumicast Corp., Chicago, has become a member of the Light Metals Div. Research Committee.

Foundry cost

The Foundry Cost Committee, meeting at A.F.S. Headquarters, December 8, agreed that two general subjects should be the basis of the session to be sponsored by the committee during the 1953 Convention of the Society. These subjects were:

(1) *"Limitations in the Applications of Present Foundry Cost Methods."*

(2) *"Foundry Costs."*

Light metals research

The Research Committee of the Light Metals Div. suggested at its December 5 meeting that colleges with foundry courses should be approached to make the showing and the study of the films on gating technique a part of their curriculum.

J. H. Jackson of Battelle Memorial Institute, Columbus, Ohio, where the light metals research for A.F.S. is conducted, reported he had discussed the possibilities of a mathematical approach to gating with fluid-flow engineers at Battelle, but was advised that studies on models seem still to be the answer in all fields of hydraulics and aerodynamics.

Since mold costs in lucite are very high, Battelle has experimented with molds made of plaster with lucite windows. This approach is generally acceptable to the committee.

The possibility of making x-ray motion pictures of flowing metal in molds was also recommended, especially in connection with thin shell molds. A shell mold of transparent plastic made from an existing shell mold pattern for possible motion picture study was suggested.

The original mold used in the research and its various sprues is being sent to A.F.S. Headquarters to be used as exhibition pieces during the showing of the films.

Cast metals handbook

On December 12, the Cast Metals Handbook Revision Committee met to plan preparation of a revised edition.

A brief outline of suggestions to be considered was presented to those in attendance for their guidance. It is planned to combine general information common to all types of metal in one special chapter, and confining specific information relating to certain metals and alloys in individual chapters. It was agreed that the primary purpose of the book was to meet the needs of the consumer and user of castings, and secondarily, the foundryman.

Steel division research

Research on hot tears will be continued by carrying out experimentation in several cooperating foundries selected to yield a variety of melting media and conditions within the foundry.

Coöperating foundries will be asked to make three test castings from each of three types of core sand which they regularly use in their casting operations, namely, low strength, medium strength and high strength core mixtures.

Core boxes will be supplied to the cooperating foundries to insure that all the cores for making hot tear test castings will be uniform as to gating as well as dimensional tolerances.

Each of the foundries will be asked to send test specimens to the Harry W. Dietert Co., Detroit, which will cooperate to make the essential high temperature sand tests on each of the core mixtures.

Sand shop course

The Sand Shop Course Committee plans three sessions for the next A.F.S. Annual Convention, to be held in Chicago, May 4-8.

Subject of the first session will be *"Pinholes in Castings."* Discussion leaders will represent the aluminum, brass & bronze, and malleable fields. The second session will cover *"Evaluation of Molding Processes—Green Sand Molding, Permanent Mold, Die Casting, Shell Molding, Core Sand Molding and Dry Sand Molding."* In the final session the subject will be *"Mulling Techniques in Relation to Casting Quality."* Discussion leaders are expected to be from General Steel Castings Corp., Granite City, Ill., and National Engineering Co., Chicago.

Malleable research

The committee has decided to continue the present work by making spot checks on the properties of the cold-melt iron using principles established with duplex iron. The work covered will be included with the report of October 24, 1952, and published as the annual progress report on this research, if such results are available sufficiently far in advance of the 1953 convention.

The new program for the year 1953-54 will be a study on *"The Effect of Melting Down Under Various Gas Atmospheres on the Resulting Characteristics of the Malleable."*

Gray iron shop course

Three Gray Iron Shop Course sessions are scheduled for the A.F.S. Annual Convention. The subject for the first session will be *"Gating, Risering, Pouring and Their Relation to Scrap."* Alternate subject: *"Banking the Cupola."*

The second session will have for discussion: *"Chill Testing as Applied to Gray Iron Practice,"* with *"Foundry Calculations and Essential Records"* as an alternate.

Session No. 3 will cover *"Carbon Control in the Cupola."* Alternate subject will be *"How Coke Burns in a Cupola."*

Eastern Canada and Ontario founders

Hold biennial conference

The Eastern Canada and Ontario Chapters of A.F.S. held their fourth All-Canadian Foundry Conference in Montreal, Que., November 6, 7, and 8, 1952. Sessions were held in the Sheraton Mount Royal Hotel and the Montreal Technical School.

Speaking at All-Canadian Conference luncheon is A. E. Cartwright, Crane, Ltd. Seated, left to right, are: J. J. F. Bancroft, Jenkins Bros., Ltd.; S. C. Holland, Robert Mitchell Co., Ltd.; and Alex Pirrie, Standard Sanitary & Dominion Radiator Ltd.

■ The All-Canadian Conference opened with a general meeting the evening of November 6 in the Montreal Technical School with an address by Walter L. Seelbach, Superior Foundry, Inc., Cleveland, immediate past president of A.F.S. He was followed by S. C. Massari, A.F.S. technical director, Chicago, who discussed gating design and showed the latest film on Society gating research. A. J. Moore, Montreal Bronze Co. Ltd., and Andrew Reyburn, Cockshutt Farm Equipment, Ltd., Brantford, Ont., were co-chairmen of the meeting. Technical chairman was M. G. MacQuiggan, C. O. Clark Co. Ltd., Montreal, and discussion leader was Alex Pirrie, Standard Sanitary & Dominion Radiator Ltd., Toronto.

In his talk, illustrated by the film, Mr. Massari summarized the trials made with varying combinations of sprues and runner designs in which special attention was paid to the shape of the system at the base of the sprue. Three basic designs were employed: (1) the inverted T; (2) the enlargement, in which the runner was enlarged laterally but not in depth at the sprue base; and (3) the well, in which the enlargement was increased in depth.

The film showed that the commonly used inverted T aspirates air freely, and its use is not recommended. The enlargement proved to be an effective design for reducing turbulence under the sprue and for preventing aspiration of air or mold gases. Its effectiveness was shown to be restricted to narrow, deep runners or square runners.

Summarizing the results of many tests, the film showed that a well located below the sprue would keep castings clean. Area of the well is recommended to be five times the area of the sprue base, while depth below the runner should be equal to the depth of the runner.

Subsequent sessions were held for cast iron, non-ferrous, and steel groups.

Study cupola practice

The cast iron group held two sessions, one at the Sheraton Mount Royal Hotel on Friday, November 7, and the second at the Montreal Technical School the following day. The chairman was W. P. Sullivan, Warden King Ltd., Montreal. T. E. Barlow, Eastern Clay Products Co. Dept., International Minerals & Chemical Corp., Chicago, Ill., spoke on cupola practice at both sessions. Ted Tafel led the discussion on the second day.

The first session, Mr. Barlow dealt with equipment used in cupola melting. Balanced blast, hot and cold blast, and basic cupolas were considered; also the optimum method of piping air to windbox and tuyeres. The speaker stressed the fact that regular cleaning and maintenance are necessary if the blowers are to provide air in accordance with their capacities. Other points made were: the nature of the vitrified layer deposited during the heat is often more important than the actual fusion point; and that contour patching reduces refractory cost per ton of metal cast.

The second session covered operational points. The cupola coke bed requires good burn-in, must be measured and timed, and uniform conditions must be maintained, Mr. Barlow said. In discussing metal charge and coke, he pointed out that coke size affects silicon pick-up, that proper sizing of cast iron scrap and selection to remove foreign material are necessary, and that accurate weighing and record keeping are essential. He recommended using 1.60 to 1.80 lb per minute per sq in. of cupola area. Above or below this range means excess coke consumption. Following daily lining repair, the lining must be thoroughly

dried, he said, adding that contour patching permits better control of melting zone, temperature and analysis.

Wm. C. H. Dunn, Western Pattern Works, Montreal, expressed the thanks of the group for Mr. Barlow's presentation.

Non-ferrous session

The first session of the non-ferrous group was on *"Getting the Most out of Bronze,"* a paper by M. J. Davidson, Canada Metal Co., Toronto. Mr. Davidson stated that decreases in volume, when copper alloys pass from the molten to the solid state, occur as liquid contraction, freezing shrinkage and solid contraction. He showed the various types of shrinkage defects in relation to casting design and location of risers and chills.

The theory of the absorption of gases in molten copper-base alloys was explained, and it was shown how casting unsoundness could result from expulsion of gases during cooling of the molten alloy.

The chairman of this meeting was C. J. Converse, Crane Ltd., Montreal.

The second non-ferrous paper *"Comparative Foundry Characteristics of Magnesium and Aluminum,"* was presented by M. Martinson, Light Alloys Foundry, Renfrew, Ont. The chairman was M. Chicoine, Robert Mitchell Co., Montreal.

Mr. Martinson preceded his subject with a brief discussion of the more prominent characteristics of aluminum and magnesium alloys, especially in respect to the 13 aluminum and 5 magnesium alloys handled in his organization. He followed this by a description of the melting techniques used and tests to determine absorption of gases; also techniques of degassing and grain refining. The importance of using the proper types of sand was stressed, and a discussion on gating and risering techniques was given.

The discussion covered: types of furnaces and crucibles used; efficiency of nitrogen and chlorine as degassers: and microshrinkage. H. J. Roast thanked both speakers for their contributions. Discussion leader was O. A. Davies, General Smelting Co., Hamilton, Ont.

The Saturday session of the non-ferrous group had for its first subject *"Rapid Tests for Melt Quality During Melting Operations."* The speaker was H. H. Fairfield, William Kennedy & Sons Ltd., Owen Sound, Ont.; the chairman was E. C. Winsborrow, Shawinigan Foundries, Ltd., Shawinigan, Que., and the discussion leader was O. A. Davies, General Smelting Co. A. J. Moore thanked the speakers on behalf of the assembly.

Tests for melts

Mr. Fairfield described a number of tests that could be used to show melt quality of brass and bronze melts. One was a fracture test and a bend test to demonstrate ductility. A button test on manganese bronze melts determined its hardness, and the relationship of this value to the tensile strength indicates what additions of zinc or aluminum must be made to secure the proper strength range. Mr. Fairfield mentioned further that such melters' tests, and their recording, act as an incentive in getting more high quality melts from each melter.

The second half of the Saturday non-ferrous session, with D. C. Sunnocks, Aluminum Co. of Canada, Ltd., as chairman featured a paper titled *"Mold Design as Related to Permanent Mold Castings"* by G. J. Ramsden, Ramsden Manufacturing, London, Ont.

Mr. Ramsden stated that a discussion between the casting designer and the mold designer was essential. He also covered the necessity of providing generous fillets at all internal and external corners; types of material best suited to the manufacture of permanent molds; the use of proper mold coatings; and appropriate mold and metal pouring temperatures. Mr. Ramsden exhibited a film showing the technique of permanent mold casting as carried out in his foundry.

The steel group held two sessions, one at the Mount Royal Hotel and the other at the Montreal Technical school.

At both sessions the chairman was R. J. Young, Dominion Engineering Works Ltd., Montreal. John W. Juppenlatz, Lebanon Steel Foundry, Lebanon, Pa., was the speaker at both meetings.

On the Friday session subject, *"Acid Electric Melting,"* the speaker advocated high input power from the start of the melt to prolong refractory life and hasten melt reactions, and to obtain more steel per hour. He advised using iron ore or oxygen to promote a vigorous boil for about 25 min, rather than a slow boil, from a high carbon charge to a point below the specified carbon. Carbon correction should be made either by the addition of pig iron or of 1/8 in. mesh granular graphite to the stream while tapping. He also said that good slag practice to obtain clean metal is obtained by using new sand and limestone to give about a 4 in. viscosimeter reading.

Oxygen should be used to start a quick boil, which should continue until it dies out itself. Oxygen prolongs roof life, improves the physical characteristics, and is almost a must where high residue alloys are charged, he said.

On the subject *"Molding Methods and the Elimination of Hot Tears,"* which Mr. Juppenlatz covered Saturday, he advocated the use of multiple in-gates to avoid hot spots.

continued on page 95

A. J. Moore, Montreal Bronze Ltd., opening the Fourth All-Canadian Foundry Conference. Seated, left to right, are: Morris G. McQuiggan, C. O. Clark Co. Ltd.; Walter L. Seelbach, Superior Foundry, Inc.; and S. C. Massari, A.F.S., Chicago.

Foundry industry puts best foot forward at

College career carnival

CLARIDON THOMAS & BRUCE HARDING / *Michigan State College*

Foundry industry booth at Career Carnival was sponsored by MSC Student Chapter, the Michigan chapters of A.F.S., and the Foundry Educational Foundation.

■ That the foundry industry had the only industry-wide display at the recent Career Carnival at Michigan State College is due to the ingenuity and energy of the Michigan chapters of A.F.S., the MSC Student Chapter, and the Foundry Educational Foundation. Held for the fourth year, the event attracted 88 companies, the Armed Forces, social services, and representatives of the foundry industry.

Object of the Career Carnival is to give students and industry an opportunity to get acquainted. Each company shows its products or illustrates its services in a booth or area assigned. Lasting two days and two evenings, some 10,000 people attended this year's exhibit. Attendance was made up primarily of college students, high school students, teachers, and vocational school instructors.

Planning for foundry industry participation got under way in the spring of 1952 when the MSC Advisory Committee of the Foundry Educational Foundation met. Money for the project was contributed by the four Michigan chapters of A.F.S. —Detroit, Saginaw Valley, Central Michigan, and Western Michigan.

The foundry industry's booth was designed to depict the carnival spirit and to show students the importance, functions, and opportunities of the cast metals industry. Members of the student chapter made up the display. Guiding the project were Paul W. Olson, Foundry Div., Eaton Mfg. Co., Vassar, Prof. C. C. Sigerfoos, and Ernest Frens, chairman of the student group.

High above the display, where it could be seen for the full length of the corridors, was an illuminated sign, "Opportunity," constructed by James Ogilvy. Flashing lights on a carnival wheel, made by Ernest Frens, showed the variety of fields of education which are useful in the foundry industry. Ashley Sinnet prepared a large display for the corner of the booth which showed with models the areas of application of metal castings and portrayed the fact that the industry is basic and stable. In the base of this display was a continuous film loop taken from the Malleable Founders' Society film *This Moving World.* The color-sound films showed basic foundry operations and was contributed by Albion Malleable Iron Co.

A map by Louis Bachinski showed how the foundry industry is distributed about the country. Also by Bachinski was a poster depicting the foundry industry as a tree with various branches labeled "gray iron," "steel," etc. Claridon Thomas made a poster which showed "Why Your Chances Are Better in the Cast Metals Industry" and another illustrating advancement opportunities.

Students stopping at the display received FEF literature and a mimeographed sheet outlining A.F.S. student chapter activities at Michigan State for the remainder of the term. A good number of students visiting the booth were interested in finding out just what the foundry industry could offer. Many were impressed by the fact that the booth represented an industry as a whole, illustrating the cooperative spirit and the desire for advancement existing in the cast metals industry.

Mr. Olson of Eaton Mfg. Co. and Charles Esgar of the Foundry Educational Foundation were in the booth most of the time to answer questions and discuss career opportunities with students and their teachers. They were aided at various times by Russell Brandt, Engineering Castings, Inc., Marshall; James McDonald, Central Foundry Div., GMC, Saginaw; Russell Peters, Eaton; Kenneth H. Priestley, Vassar Electroloy Products, Inc., Vassar; Prof. Sigerfoos; and students Ernest Frens, Ashley Sinnett, Robert Grace, Bruce Harding, Louis Bachinski, and Claridon Thomas.

Working on display plans as a committee under the chairmanship of Mr. Olson were: Ross P. Schaffer, Lakey Foundry & Machine Co., Muskegon; David W. Boyd, Engineering Castings, Inc., Marshall; and Prof. Sigerfoos, and Messrs. Esgar and Frens.

▶ *Programs for February foundry conferences*

California regional

The first California Regional features a management luncheon with A.F.S. Vice-President Collins L. Carter as speaker, six technical sessions, and a luncheon and dinner. Chairman of the two-day meeting is Andrew M. Ondreyco, General Metals Corp., Oakland. Details not given here on registration and reservations for the conference—to be held at the Claremont Hotel, Berkeley, Calif., February 6 and 7—can be obtained from John Bermingham, E. F. Houghton Co., 593 Market St., San Francisco 5, Calif. Room reservations at the Claremont should be made direct and promptly.

FRIDAY, FEBRUARY 6

10:00 a.m. .. REGISTRATION.
12:15 p.m. .. MANAGEMENT LUNCHEON. Speakers: Collins L. Carter, Albion Malleable Iron Co., Albion, Mich., Vice-President of A.F.S., and Wm. W. Maloney, Secretary-Treasurer, A.F.S.
3:00 p.m. .. *"Costing,"* Earl Paltenghi, H. C. Macaulay Foundry Co., Berkeley.
8:00 p.m. .. *"Shell Molding,"* A. L. Goodreau, American Brass & Aluminum Foundry, Los Angeles.

SATURDAY, FEBRUARY 7

9:00 a.m. .. *"Gating and Risering,"* Arnold K. Steger, Hanford Foundry, San Bernardino, Calif.
10:30 a.m. .. *"Basic Lined Cupola,"* Sam F. Carter, American Cast Iron Pipe Co., Birmingham, Ala.
1:30 p.m. .. *"Mineral Perlite,"* Harold R. Wolfer, Puget Sound Naval Shipyard, Bremerton, Wash.
3:00 p.m. .. *"Sand,"* Harry W. Dietert, Harry W. Dietert Co., Detroit.

Wisconsin regional

Arrangements have been completed for the 16th Annual Wisconsin Regional Foundry Conference under the chairmanship of A. F. Pfeiffer, Allis-Chalmers Mfg. Co., Milwaukee. Meetings will be held at Hotel Schroeder, Milwaukee, February 12 and 13. Full conference tickets are $12.00. Advance registration can be made through Leonard Gratz, G. & O. Pattern Works, 1630 Pierce St., Milwaukee 4, Wis. The program will be as follows:

THURSDAY, FEBRUARY 12

9:00 a.m. .. REGISTRATION.
10:00 a.m. .. WELCOMING ADDRESSES.
I. R. Wagner, Electric Steel Casting Co., Indianapolis, National President, A.F.S., and Dean M. O. Withey, University of Wisconsin.
10:40 - 11:50 a.m. .. *"Their Health is Our Business,"* Walter F. Scholtz, Allis-Chalmers Mfg. Co.
12:00 Noon .. LUNCHEON. *"How's Your Sense of Humor?"* E. A. McFaul.
2:15 p.m. .. SECTIONAL MEETINGS. Malleable .. *"How to Get More Production with Controlled Sands,"* Frank S. Brewster, Harry W. Dietert Co.
Non-ferrous .. *"Fracture Test of Melt Quality,"* George P. Halliwell, H. Kramer & Co., Chicago.
Gray Iron .. *"Foolproof Sand Works for a Wide Range of Castings,"* J. S. Schumacher, Hill & Griffith Co.
Steel .. *"Strain Theory of Hot Tearing,"* W. S. Pellini, Naval Research Laboratory, Washington, D. C.
Pattern .. *"Pattern Equipment as It Affects Foundry Equipment,"* J. W. Costello, American Hoist & Derrick Co., St. Paul, Minn.
4:00 p.m. .. SECTIONAL MEETINGS. Malleable .. *"Snagging at Its Best,"* Russell L. King, Bay State Abrasive Products Co.
Non-Ferrous .. *"Sand - Synthetic - Natural - Semi-synthetic,"* George W. Anselman, Beloit Foundry Co.
Gray Iron .. *"How Iron and Steel Melt in the Cupola,"* Daniel E. Krause, Gray Iron Research Institute, Columbus, Ohio.
Steel .. *"Core Oils vs. Resin Binders,"* Clyde Wyman, Burnside Steel Foundry, Chicago.
Pattern .. *"Design of Core Boxes and Dryers for Core Blowing,"* E. Blake.
6:30 p.m. .. BANQUET. *"Business and Industry in an Atomic Age,"* Henry Pildner, Cleveland.

FRIDAY, FEBRUARY 13

10:00 a.m. .. SECTIONAL MEETINGS. Malleable .. *"Shell Molding and Equipment,"* Richard Herold, Borden Co., New York.
Non-Ferrous .. *"Effect of Gating Design on Casting Quality,"* Walter Bonsack, Christensen Corp., Chicago.
Gray Iron .. *"Fluidity Testing of Gray Cast Iron,"* P. C. Rosenthal, University of Wisconsin.
Steel .. *"Good Casting Design on Purpose,"* Robert J. Franck, Superior Steel & Malleable Castings Co., Benton Harbor, Mich.
Pattern .. *"Industry Looks at Apprenticeship Training,"* R. G. Greiner, Allis-Chalmers Mfg. Co.
12:00 Noon .. LUNCHEON. *"Your American Foundryman,"* H. F. Scobie, Editor, AMERICAN FOUNDRYMEN; *"Foundry Educational Foundation,"* George Dreher, Foundry Educational Foundation, Cleveland.
2:30 p.m. .. SECTIONAL MEETINGS. Malleable .. *"Principles of Control of Chemistry and Related Properties in Malleable Irons,"* Richard W. Heine, University of Wisconsin.
Non-Ferrous .. *"Information Forum,"* Messrs. Halliwell, Anselman, and Bonsack, and Carl Van Buren, Allis-Chalmers Mfg. Co.
Gray Iron .. *"Casting Defects as Related to Sand Practice,"* Thomas E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., Chicago.
Steel .. *"Material Handling in the Cleaning Room,"* Duane Bosma, Bucyrus Erie Co., South Milwaukee, Wis.
Pattern .. *"New Developments in Pattern Practice,"* James Mathias, Accurate Match Plate Co., Chicago.

Southeastern regional

The Southeastern Regional Conference will be held at the Tutwiler Hotel, Birmingham, Ala., February 20-21. Fred K. Brown, of Fred K. Brown, Inc., Birmingham, is general chairman. Full program will be published in the February issue.

Chairmen of 1st California Regional Foundry Conference, left to right, are: William Gibbons, Ridge Foundry, San Leandro, technical section chairman; Andrew M. Ondreyco, General Metals Corp., Oakland, general chairman; John Bermingham, E. F. Houghton & Co., San Francisco, arrangements chairman.

foundry tradenews

Hammond Lane Foundry Co., Ltd., Dublin, and its associate companies, one of the largest industrial groups in Ireland, recently celebrated its golden jubilee. The company's magazine, "One Hundred and Eleven," marked the event by a special anniversary edition which outlines Hammond Lane's growth from a small, poorly-equipped foundry, which had been idle for some time, to the present holding company which is the majority stockholder in 12 separate companies which had their origin in the parent organization.

To broaden understanding of malleable iron and help place it in a "proper and reasonable perspective," **Albion Malleable Iron Co.,** Albion, Mich., has published a new brochure. The pamphlet defines this basic material, its properties and its relation to other ferrous materials. Included is information on malleable iron's properties, characteristics and outstanding qualities.

Lebanon Steel Foundry, Lebanon, Pa., has announced that prints of its moving picture, "Steel with a Thousand Qualities," have been ordered by the Mutual Security Agency for showing abroad in MSA nations. The film depicts methods used by modern American foundries in casting metals ranging from valve castings to stainless steel components for jet aircraft engines. The film is in color and runs approximately 37 minutes.

Steel Founders' Society of America has been cited for national recognition as winner of the 1952 Award of Merit, an honor conferred by American Trade Association Executives for distinguished service by a national association. The permanent award plaque was presented at the annual meeting of ATAE, international society of professional trade association executives.

Walter Gerlinger, Inc., Milwaukee, is sponsoring a project at the University of Wisconsin on a new high pressure molding technique. Under the direction of Prof. R. W. Heine, the project is designed to develop a new method of molding, using high pressures, little or no clay materials, and no moisture. Improved surface finish and dimensional accuracy of the casting are prime objectives of the new molding process.

Pittsburgh Lectromelt Furnace Corp., recently contracted to install for Samuel Fox & Co. Ltd., Sheffield, England what is expected to be the largest electric arc melting furnace in Britain. W. B. Wallis, president of Lectromelt, flew to England to help complete the contract. He said, "The furnace will be 19 ft in diameter, can operate at about 80 tons per heat although the British call it a 70 ton furnace. The maximum they have been using is 30 tons." The order was obtained by the Birmingham firm of Birlec Ltd., English representative of Lectromelt.

The course of future technical research to be sponsored by **Alloy Casting Institute** was decided at ACI's recent meeting in Columbus, Ohio. Discussions at the meeting determined what percentage of future programs should be concerned with fundamental metallurgical research, and what percentage should be devoted to developments, testing or other topics. It is expected that the research programs laid out at this meeting will be the source of much useful information for high alloy casting consumers.

Riverside Foundry, Bettendorf, Iowa has added a new steel foundry to its gray iron foundry as part of its two-year $4,00,000 expansion program. Each foundry is a totally independent unit operating under the same large roof. With this added facility, Riverside is now able to engineer any kind of steel and gray iron casting. Although Riverside was established only 6 years ago it now ranks as the largest independent steel and gray iron foundry in Iowa as well as in the Middle West.

Dominion Magnesium, Ltd., Toronto, Canada, has expanded its operations. The latest addition is the new **Light Alloys Ltd.** magnesium foundry, the largest and most modern in Canada. This $2 million government-financed plant, recently opened at Haley, Ont., was designed for the production of Orenda jet engine castings and aircraft components for A. V. Roe Canada, Ltd. The 70,000 sq ft plant will eventually have a capacity of nearly 5 million lb of light metal castings per year.

American Machine & Foundry Co., New York, has reported an increase in 9 months' earnings. The consolidated net income available to common stock for the 9 months ended September 30, 1952 is equivalent to $1.41 per share. This compares with net income of $1.15 per share for the same period in 1951.

Griffin Wheel Co., Chicago, has begun construction on an addition to its plant to increase its capacity for the production of railroad wheels. The new accession will contain 20,000 sq ft of floor area.

Cooper-Bessemer Corp., Mount Vernon, Ohio, has announced the formation of two foreign trade subsidiaries. Known as **Cooper-Bessemer International Corp.,** and **Cooper-Bessemer Overseas Corp.,** the new companies serve as exclusive export sales distributors for Cooper-Bessemer engines and compressors.

▶ Demonstrates electrode controls

Charles W. Vokac (center), Whiting Corp., Harvey, Ill., explains how newly developed controls on direct-arc furnace at University of Illinois (Chicago) markedly reduce melting time, cut reactance to 5 per cent on melt-down to give close to unity power factor. Looking on are T. D. Cassidy (left), Crane Co., Chicago, and Ted Wayne, U. S. Steel Co., Chicago.

abstracts

Abstracts below have been prepared by Research Information Service of The John Crerar Library, 86 East Randolph Street, Chicago 1, Ill. For photoduplication of any of the articles abstracted below, write to Photoduplication Service at the above address, identifying articles fully, and enclosing check for prepayment. Each article of ten pages or fraction thereof is $1.40, including postage. Articles over ten pages are an additional $1.40 for each ten pages. A substantial saving is offered by purchase of coupons in advance. For a brochure describing Crerar's library research service, write to Research Information Service.

Sampling for analysis

A257..."Sampling for Analysis," *Foundry Trade Journal*, vol. 93, no. 1882, September 25, 1952, pp. 357-358, 364.

The usual methods of sampling may have the disadvantages of losing graphite through the fine dust which such practices generate, and not having the correct proportion of the various particle sizes.

This article discusses the methods of (1) sieving the bulk into fractions, weighing, and taking the correct proportion of each; (2) reduction by crushing; (3) sampling by means of a slowly rotating fine drill; and (4) taking the whole of a selected solid test piece. Results indicated that methods (3) and (4) provided the most consistent analyses.

Brass foundry layout

A258..."Simple Mechanical Layout for the Jobbing Brass Foundry", F. C. Evans, *Foundry Trade Journal*, vol. 93, no. 1877, August 21, 1952, pp. 201-205.

This article describes a set-up that is becoming more common in this country —a section of a brass foundry in which high productivity is attained by the use of mechanical aids.

The equipment comprises: (1) a portable or hydraulic-squeeze molding machine; (2) a roller-conveyor track, with a suitable return conveyor; and (3) a knockout unit with a worm conveyor elevator with foot-operated water sprays in the hopper. Stages of mechanization of a non-ferrous foundry with five molding stations are shown, with number of operators, molds per man-hour and capital investment per stage.

Sand-cast beryllium bronze

A259..."Sand-cast Beryllium Bronze," L. Grand, *Foundry Trade Journal*, vol. 93, no 1881, September 18, 1952, pp. 317-324.

Beryllium-bronze is one of the high grade bronzes, with excellent casting properties, good working properties, and high mechanical strength. This article is a study of the composition of copper/beryllium as to micrographic structure, macrographic structure, castability pouring temperature, oxidation, mechanical properties and other factors. The data are illustrated by a number of microphotographs, charts, tables, and pictorial material showing casting procedures.

Magnesium alloy fractures

A260..."Identification of Fractures in Cast Magnesium Alloys", P. F. George and H. A. Diehl, *Metal Progress*, vol. 62, no. 4, October 1952, pp. 121-122.

Characteristics of failure-fractures of magnesium castings used in normal load-carrying and reciprocating units show the cause of failure. Visual examination detects differences in texture and color. Macro-examination distinguishes between fatigue and stress-corrosion cracks. Micro-examinations of as-cast metal are illustrated by photo-micrographs.

Malleable shrinkage

A261..."The Determination of Shrinkage in Malleable Cast Iron," A. Bordes, *Giesserei*, Vol. 39, No. 9, May 1, 1952, pp. 201-203. (In German)

The author discusses the various causes of shrinkage in malleable cast iron and the forms it takes. The calculation of these shrinkages is dependent upon discovery of the real specific weight of the malleable hard iron, which is a hard task. There is a direct relationship between the proneness to shrinkage and the hygrometric conditions.

Aluminum automotive castings

A262..."Progress Report—Aluminum in Automobiles," J. H. Dunn and E. P. White, *Modern Metals*, Vol. 8, No. 8, September 1952, pp. 42-51.

Some notable developments have recently been made on the applications of aluminum in the automotive industry. A new concept is to assemble intricate shapes from relatively simple, easy to make, high production components by means of brazing. The brazing operation is discussed thoroughly. Investigations as to the suitability of aluminum die castings for use in highly stressed components have lead to the belief that in the near future the number of die castings employed will increase greatly. The use of plaster castings have been investigated and found applicable in the castings of intricate shapes.

Manganese steel castings

A263..."Production of Manganese Steel Castings", F. Cousans and W. C. Meredith, *Foundry Trade Journal*, vol. 93, no. 1880, September 11, 1952, pp. 287-293.

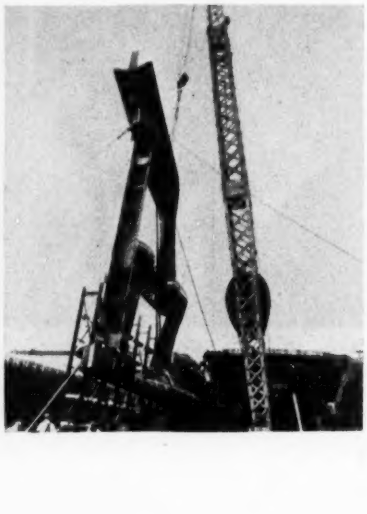
Following a brief history of manganese steel, the authors present in detail present day foundry methods for this material. Molding materials and washes, feeding heads, pouring, knocking-out and quenching are dealt with at length. The account concludes with mold layouts of numerous examples of important castings, such as dredger-bucket lips, breaker bars, swing-type hammers, crusher jaws, dragline excavators, chain links and tramway crossings.

Investment cast test bars

A264..."Test Bar Design Influences Investment Castings," R. J. Wilcox, *SAE Journal*, Vol. 60, No. 7, July 1952, pp. 32-36.

Test bars for investment castings may be produced in one of two ways: cast-to-size or machined-to-size. To evaluate which method is more reliable, the author has examined bars of various grades of steel made by both methods. Cast-to-size bars generally show a greater deviation in properties and lower values of elongation and reduction.

▶ *Steel casting bolsters giant ship*



The 48-ton steel casting illustrated serves as the rugged framework supporting the heavy wheel-shaft, propeller, and rudder of a new 647-foot ore carrier built for service on the Great Lakes. One of the largest steel casting assemblies ever produced for this type of ship construction, this 96,000-pound giant is 28 ft high, and measures 25 ft from front to back.

Due to its massive size, the specially-designed key structural unit was cast in five sections by Penn Steel Castings Company, Chester, Pa. The sections were joined by welding. Three new ore carriers of the same type, each with ore-carrying capacity of 19,600 gross tons, have been launched in recent months. Photo shows casting being hoisted into place in ship framework.

A.F.S. Publications

	Publication Number	A.F.S. Members	Non-Members
Books			
Alloy Cast Irons Handbook (2nd Edition)	1	$2.75	$4.50
Analysis of Casting Defects	3	2.50	4.25
Copper-Base Alloys Foundry Practices	57	3.75	5.75
Cupola Operations Handbook	7	6.00	10.00
Development of Metal Castings Industry	8	3.00	6.00
Foundry Core Practice (2nd Edition)	38	6.50	10.00
Foundry Sand Handbook (6th Edition)	12	3.50	5.25
Foundry Work	50	1.76	1.76
Patternmaker's Manual (Available Dec. 15—price to be determined)	61	—	—
Recommended Practices for Sand Casting Aluminum & Magnesium Alloys	24	1.00	1.75
Symposia			
Foundry Dust Control	10	1.00	2.00
Malleable Foundry Sand and Core Practice	16	2.00	3.25
Sand Test Data for Production of Steel Castings	47	3.00	4.75
Symposium on Air Pollution	62	1.75	2.50
Symposium on Principles of Gating	56	4.00	5.75
Foundry cost booklets			
Classification of Foundry Cost Factors	6	1.00	2.00
Foundry Cost Methods	9	1.50	3.00
Recommended practices—safety and hygiene			
Fundamentals of Design, Construction and Maintenance of Exhaust Systems	19	3.00	5.00
Good Practices for Metal Cleaning Sanitation	20	1.25	2.25
Grinding, Polishing and Buffing Equipment Sanitation	22	.75	.75
Health Protection in Foundry Practice	59	3.00	4.50
Safety Practice for Protection of Workers in Foundries	21	1.25	2.25
Testing and Measuring Air Flow	26	1.00	2.00
Annual Transactions			
Volume 53—1945	30	4.00	15.00
Volume 54—1946	31	4.00	15.00
Volume 55—1947	32	4.00	15.00
Volume 57—1949	33	8.00	15.00
Volume 59—1951	48	8.00	15.00
Volume 60—1952	60	8.00	15.00
Index to AFS Transactions (1930-1940)	36	1.00	2.00
Education			
Apprentice Training Standards for the Foundry Industry	29	1.00	2.00
Foundry Apprentice Course Outline	39	1.00	2.00
Guide for Foremen Training Conferences	34	1.50	2.25
A. F. S. research progress reports			
Light Metals—A Study of the Principles of Gating	54	1.00	1.50
Light Metals—Principles of Gating as Applied to Sprue-Base Design	58	.50	.75
Brass and Bronze—Melt Quality and Fracture Characteristics of 85-5-5-5	55	1.00	1.50
Gray Iron—Risering of Gray Iron Castings—Report No. 1	42	1.00	2.00
Gray Iron—Risering of Gray Iron Castings—Report No. 2	43	1.00	2.00
Malleable—Surface Hardening of Pearlitic Malleable Irons	52	.40	.60
Steel—Steel Sands at Elevated Temperatures (Tenth)	53	.40	.60
A. F. S. special publications			
Bibliography of Centrifugal Casting	35	1.50	2.25
Cupola Research Committee Reports	49	1.00	1.50
Engineering Properties of Cast Iron	46	2.25	3.50
85-5-5-5 Test Bar Design (Fourth Annual Lecture—1946)	37	1.00	2.00
Gating Terminology Chart (Discount on Quantity Lots)	14	.10	.25
Graphite Classification Chart (25 x 38 in.)	44	1.25	1.75
Pattern Standard Color Chart (Discount on Quantity Lots)	51	.10	.25
Permanent Mold Castings Bibliography	18	1.50	3.00
Statistical Quality Control for Foundries (Available January, 1953—Price to be determined)	63	—	—
Other publications			
Aluminum Foundry Process Control (SAE)	2	1.00	2.50
Ferrous Foundry Process Control (SAE)	11	1.50	2.50
Gates and Risers for Castings (Penton Pub. Co.)	40	6.00	6.00
Non-Ferrous Melting Practice (AIME)	41	3.00	3.50

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chapternews

Wisconsin Student Chapter first in '53

Latest addition to the A.F.S. family is the student chapter at the University of Wisconsin, Madison. A broth of a youngster, the new chapter comes to the Society with 18 names on its roster.

One of Old Man Stork's chief helpers in this happy event was Prof. George J. Barker, chairman of the A.F.S. Educational Division. R. W. Heine, assistant professor, will act as the chapter's faculty advisor. The Wisconsin Chapter is to select the industrial advisor for the group. Through Prof. Barker and Heine and Prof. E. R. Shorey, chairman of the Department of Mining and Metallurgy; the chapter has long maintained close relations with foundry teaching at the university, which was one of the first Foundry Education Foundation schools.

Officers elected by the new student chapter are J. H. Dance, president; C. R. Loper, Jr., vice-president; and J. H. Davies, Jr., secretary-treasurer. Installation of this the 14th A.F.S. student chapter was scheduled for January 15.

Names of students who signed the petition for chapter membership are Harold Shannon and Paul M. Benson (student members of the Wisconsin Chapter who now transfer their memberships to the student group), Malcolm S. Grahm, Carl R. Loper, Jr., James Selle, Roger L. Schluter, John

O. Leer, Glenn N. Reinemann, John K. Williams, Richard M. Gregory, William H. Miller, James J. Wert, John H. Walter, James H. Dance, Ronald L. Zaitz, James H. Davies, Jr., Marc F. Momsen, and John A. Hren.

Rochester Chapter

H. G. STELLWAGEN
Hetzler Foundries, Inc.

Foundrymen of the Rochester area heard an especially interesting speech by Max T. Ganzauge, Rochester. A past chairman of the Rochester Chapter, Mr. Ganzauge has just returned from an extensive tour of Turkey, where he served as a foundry consultant to the Turkish government on Turkish foundry practices.

"Older army officials and industrial officials in Turkey are mostly German trained men," Mr. Ganzauge observed. "But a majority of the younger men have been educated in America." He believes the country to be solidly anti-communistic and that it has a great industrial future.

According to Mr. Ganzauge, Turkish foundrymen were making some of the most intricate of brass and bronze castings over 500 years ago. Examples of their workmanship include brass cannon weighing up to 500 pounds some of which are still in use.

Turkey has four steel foundries in operation, 12 gray-iron foundries and a large number of small brass and bronze foundries. The number of small foundries is increasing largely because industries employing ten or more persons are heavily taxed. Molders make approximately $250 per month. Iron molders are paid by the pound—approximately 7 cents. Prevailing price of brass castings is 55 cents per pound.

"Throughout the industry," Mr. Ganzauge asserted, "old fashioned methods prevail. Flask equipment is not commonly used. The industry's greatest need is for trained, practical foundry foremen and engineers to acquaint workers with the use of modern equipment. Increased productivity is essential to Turkey and equipment manufacturers should find there an ever-increasing market. Turkey exports chrome ore, antimony and lead and it has some of the highest grade ore deposits in the world—averaging 60 per cent iron."

Following the address, an interesting question-and-answer session was conducted.

Central Indiana

WM. H. FAUST
Electric Steel Castings Co.

In keeping with the current A.F.S. emphasis toward making the foundry a more desirable place in which to work, the Central Indiana Chapter devoted its December meeting to consideration of safety, hygiene and air pollution problems.

Guest speaker at the monthly dinner meeting was William N. Davis, Director of the A. F. S. Safety, Hygiene and Air Pollution Program, Chicago. J. P. Lentz, International Harvester Co., Indianapolis, served as program chairman.

Mr. Davis pointed out that the accident frequency rate for the foundry industry is 26.9 lost-time accidents per million man hours of work. He compared this to the 13.5 rate for all the industry and the 4.6 record for the Steel industry—an industry which has fully as many hazards as do the foundries.

To change this situation The S & H & AP Committee is preparing a film which will soon be available and is organizing safety training courses to be presented in various areas. Safety seminars also are scheduled to be held at the Universities of Wisconsin and Illinois early next year (see page 59).

An Air Pollution manual is in process of development which will furnish the foundry with information gathered from various research projects. Battelle Memorial Institute, Columbus Ohio was mentioned as having done consid-

Proof that good fellowship prevailed at November meeting of the Cincinnati District Chapter is evidenced by (left to right) Irving H. Judd, Standard Castings Co., William J. Love, Jr., Lunkenheimer Co., J. B. Caine, foundry consultant and speaker of the evening, Henry F. McFarlin, Henry Wood Co., and Martin F. Milligan, Lunkenheimer Co., all of Cincinnati.

"Pouring" technique is demonstrated by Walter Bonsack, Christensen Corp., Chicago, for Morris Berger, Armour Foundation, and John A. Rossenfoss, American Steel Foundries, just before he presented the A.F.S. film on gating at November meeting of Chicago Chapter.

erable research work on this subject.

One of the biggest problems, Mr. Davis said, is the development of economical equipment. An electrostatic precipitator, for instance, is far too expensive for most foundries. Equipment manufacturers are making considerable progress, however, toward production of less expensive control equipment.

Saginaw Valley

ROY S. DAHMER
Eaton Mfg. Co.

"Techniques and Developments in Shell Molding" was the topic discussed at the December meeting of the Saginaw Valley Chapter. The panel of speakers included William Rose, Borden Co., New York, Russell LeBeau, Sutter Products Co., and Vaughan C. Reid, City Pattern and Machine Co., both of Detroit.

Mr. Reid discussed pattern equipment and production techniques used in shell molding. He stressed the importance of close cooperation between the foundry and the casting designer, the necessity of having pattern material that will remain stable at high temperatures, the need for uniform pattern thickness to maintain uniform temperature, and the advantages of a high degree of polish on the pattern surface.

Discussing recent developments in shell-molding resins and sands, Mr. Rose indicated that satisfactory molds are being made with sands varying in A. F. S. fineness from 80 to 180 and with resin quantities varying from 5 to 9 per cent. He described the "wet mix" in which a resin coating is given to each grain of sand to reduce the tendency to separate experienced in the use of dry mixes. Mr. Rose asserted that this methanol or "wet method" produces molds of higher permeability, and greater strength, and that the investment time is halved.

Mr. LeBeau discussed the latest shell mold equipment and listed three basic requirements for such equipment: (1) it must be of rugged design; (2) it must have flexibility and ease of operation, incorporating quick adjustments for pattern temperature, investment time, curing temperature, and curing time; and (3) it must give the highest production at the lowest cost. It was indicated that single station machines have been found the most practical and economical at present.

Panel of experts who discussed "Techniques and Developments in Shell Molding" at December meeting of Saginaw Valley Chapter included (left to right) John Steinbach and William Rose, both of Bordon Co., New York, and Russell LeBeau, Sutter Machine Co., Detroit.

Southern California

K. F. SHECKLER
Calmo Engineering Co.

The 16th Annual Christmas Stag of the Southern California Chapter was attended by over 500 Foundrymen and their guests who enjoyed an entertainment-packed evening.

The Entertainment Committee, with Robert Ditmore, American Smelting & Refining Co., Los Angeles, as chairman, presented an excellent variety show including several talented musicians as well as some new faces in the interpretive dancing department.

Central Michigan

DON I. HUIZENGA
Albion Malleable

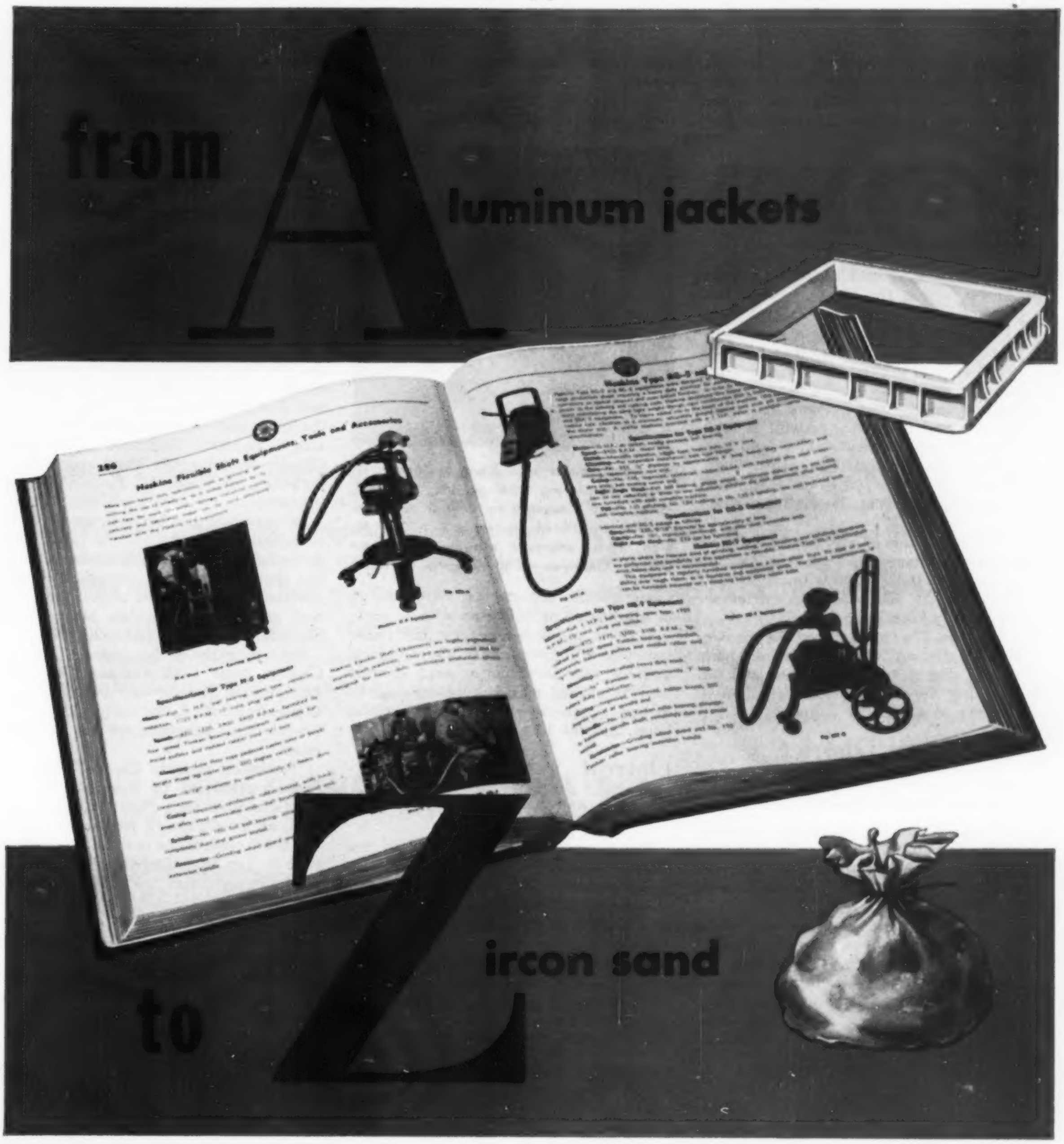
Instrumental in establishing the student chapter at Michigan State College, the Central Michigan Chapter during the past twelve months has enlarged its educational functions to include the establishment and support of foundry courses in the Battle Creek and Charlotte high schools.

Support has been both financial and advisory. The educational committee under the leadership of present chapter chairman David W. Boyd, Engineering Castings, Inc., Marshall, Mich., is directly responsible for most of the work accomplished.

The Chapter's November meeting was designated Youth Encouragment Night which is to be an annual affair. Preceding the evening meeting, plant visitations were arranged for students and faculty members of the Battle Creek, Charlotte, and Kalamazoo high schools at U. S. Foundry Corp., in Kalamazoo, and at Engineering Castings, Inc., in Marshall. The personnel of the two companies conducted tours giving the students practical aspects of the foundry industry.

Chairman Boyd opened the evening program with a brief history of the foundry industry and explained how fundamental it is to our way of life. During the course of the program, Past Chairman T. T. Lloyd, Albion Malleable Iron Co., presented to Mr. Boyd a molder's rammer which was given to the chapter by the Albion Pattern Shop. This beautiful molder's rammer was engraved with the names of past chapter chairmen and has room for the names of 21 future chairmen.

Speaker for the evening was L. C.



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Beers, Claude Schneible Co., Detroit, who presented the film "The Invisible Shield," a picture dealing with the use of modern equipment in foundry dust control.

Birmingham

J. P. MC CLENDON
Stockham Valves & Fittings

Birmingham Chapter currently is sponsoring its second Local Apprentice Contest within the Chapter area. This Contest includes molding in gray iron, steel and non-ferrous metals and pattern-making in wood and metal.

The contest is conducted in much the same manner as the National A.F.S. Contest except that persons above the age limit set by A.F.S. as well as Alabama Foundry Educational Foundation students are permitted to enter. These entries, of course, will be eliminated from the judging in the National Contest.

Defense Bonds of $50, $25, and $10 in Savings Stamps will be awarded to first, second, and third place winners in each of the events. A number of entries already have been received.

Chapter Chairman, Fred K. Brown, Fred K. Brown Co., Inc., Birmingham, asserts that this year's contest will top anything the Chapter has yet done in the way of apprentice contests.

Cincinnati District

DAVID J. PUSACK
Cincinnati Milling Machine Co.

Program for the November meeting of the Cincinnati District Chapter featured a thought-provoking talk on foundry sands by Jack B. Caine, Foundry Consultant.

Mr. Caine raised the question, "What Do We Know About Foundry Sands." His answer, in general, was that we know little and are very often proceeding in the wrong direction in our efforts to learn. He sees the job of sand control as primarily a matter first of evaluation, then of application and lastly of control.

The problem of evaluation involves the making of many thousands of tests until specific defects can be produced or eliminated at will from specific castings. Evaluation of this type, Mr. Caine believes, will reveal that many defects usually associated with sand trouble may be caused by other factors such as design, pouring temperature, metal head, and the like.

Molder's rammer held aloft by David W. Boyd, Engineering Castings, Inc., Marshall, Mich., was presented to Central Michigan Chapter by Albion Malleable Iron Co., Albion, Mich., engraved with names of past Chapter Chairmen—with room for 21 more.

Detroit

WALTER P. KANTZLER
Kelsey Hayes Wheel Co.

There was "money to burn" at the Detroit Chapter's Christmas party as approximately 210 members enjoyed themselves as "Millionaires for a Night" at the Belle Isle Casino.

Each member received "$150,000" to use at the gaming tables where blackjack, chuck-a-luck, roulette, dice and other games of chance offered unlimited stakes. Some 30 prizes donated by suppliers, were auctioned off at the end of the evening to the highest bidder. The first prize, a multi-wave radio was auctioned for "$12,000,000."

Arrangements for the unusual party were made by H. E. Gravlin, Ford Motor Co., Jess Toth, Harry W. Dietiert & Co., Vaughn C. Reid, City Pattern & Machine Co., and G. Passman, Frederic B. Stevens Co., all of Detroit.

Metropolitan

W. T. BOURKE
American Brake Shoe Co.

"Laboratory control is important in small as well as in large foundries," was the gist of a speech made by Lewis H. Gross, American Radiator and Standard Sanitary Corp., Baltimore, Md., at the November meeting of the Metropolitan Chapter. Technical Chairman, Charles M. Schwalje, Worthington Corporation, Harrison, N. J., presided at the session.

Emphasizing the importance of close cooperation in order for the laboratory to evaluate and transmit information to the shop, the speaker summarized important phases of good cupola practice and gave some valuable pointers on practical operating conditions.

Preceding the main address, Mr. H. Charles Esgar, Staff Assistant, Foundry Educational Foundation, discussed and summarized, with the aid of slides, the Foundation's program, for the past five years.

"Statistical Quality Control" was the subject discussed by Ross Martin, Jr., McWane Cast Iron Pipe Co., Birmingham, at the Chapter's November meeting. Such control is a tool, he said, which enables him to make better decisions in producing a given product at a higher quality level. He told how statistical analysis removes the element of change from decisions regarding changes in production processes.

Mr. Martin used several slides to indicate the effectiveness of quality control through statistics. The questions and discussion after the talk showed a genu-

Investment castings of impeller plates are examined during recent field trip made by Michigan State College student chapter. Roland Banister (second from right) of Midwest Foundry, Coldwater, Mich., conducted tour through Midwest's Investment Casting Division which he manages. Students and faculty members saw demonstration of "lost-wax" process in pattern making, then saw castings poured.

ine interest on the part of the group in learning more about so valuable a program.

Guest Speaker Ross Martin, Jr., (left) poses with B. W. Worthington (both of McWane Cast Iron Pipe Co. Birmingham, Ala.) just before November meeting of the Metropolitan Chapter at Essex House, Newark, N. J.

Other organizations

New England

MYRON DE HOLLANDER
Lynn River Works

The December meeting of the New England Foundrymen's Association was attended by some 100 members and guests. During the business session conducted by President Frank R. Elliot, a nominating committee was appointed to present the slate of proposed officers for 1953 at the Annual Meeting.

C. E. Herington, Meehanite Metal Corp., New Rochelle, N. Y., was the speaker of the evening. To illustrate the adaptation of Meehanite castings to industry, a sound motion picture "Meehanite Means Better Castings" was shown to the group. Following the showing of the film, an interesting question-and-answer session was conducted.

Connecticut

LOUIS G. TARANTINO
Secretary

Round-table discussion at the November meeting of the Connecticut Non-Ferrous Foundrymen's Association was led by Stafford W. Chappell, Jr., General Dynamics Corp., Groton, Conn. Among others the following problems were considered:

In producing ½ in. cores from sand with urea formaldehyde resin binder baked in dielectric oven, the cores are found to be ready to collapse in molds not poured fairly quickly. While quite hard when placed in the mold, they cannot be picked up by hand an hour later without collapsing. The answer arrived at was that the cores must not have been thoroughly baked despite their satisfactory appearance. Unless urea formaldehyde cores are fully baked they are definitely hygroscopic and will

pull moisture from surrounding molding sand.

How good castings can be made with metal melted under a reducing atmosphere was also considered. The solution seems to depend on the reducing agent used and its amount. Copper oxide released by rough-top ingots often offsets reducing atmosphere in indirect-arc furnaces.

contributions

continued from page 60

Goulds Pumps, Inc., Seneca Falls, N. Y.
Grede Foundries, Inc., Milwaukee.
Hackett Brass Foundry, Detroit.
Hamilton Brass & Aluminum Cstgs. Co., Hamilton, Ohio.
Hamilton Foundry & Machine Co., Hamilton, Ohio.
Hanford Foundry Co., San Bernardino, Calif.
Hansell-Elcock Co., Chicago.
Arthur Harris & Co., Chicago.
Hartford Electric Steel Corp., Hartford, Conn.
Hays Mfg. Co., Erie, Pa.
Herman Pneumatic Machine Co., Pittsburgh.
W. S. Hodge Foundry, Greenville, Pa.
Hoosier Iron Works, Kokomo, Ind.
Illium Corp., Freeport, Ill.
Induction Steel Castings Co., East Detroit, Mich.
Inland Lakes Foundry Co., Cadillac, Mich.
Inter-State Foundry Co., Inc., Indianapolis.
Iron Lung Ventilator Co., Cleveland.
Jamestown Malleable Iron Corp., Jamestown, N. Y.
James Jones Co., Los Angeles.
Kay-Brunner Steel Products, Inc., Alhambra, Calif.
Kencroft Malleable Co., Inc., Buffalo, N. Y.
Kendrick Mfg. Co., Detroit.
Keuthan Foundry Co., Middletown, Ohio.
Key Co., East St. Louis, Ill.
Kincaid-Osburn Electric Steel Co., San Antonio.
Kirsh Foundry, Inc., Beaver Dam, Wis.
Lakeside Malleable Castings Co., Racine, Wis.
Lawran Foundry Co., Milwaukee.
Leslie Co., Lyndhurst, N. J.
Lindgren Foundry Co., Batavia, Ill.
Link-Belt Co., Philadelphia.
Littlestown Hdw. & Fdy. Co., Inc., Littlestown, Pa.
Locomotive Finished Material Co., Atchison, Kan.

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Lynchburg Foundry Co., Lynchburg, Va.
H. C. Macaulay Foundry Co., Berkeley, Calif.
Malleable Iron Fittings Co., Branford, Conn.
Clayton Mark & Co., Evanston, Ill.
Messmer Brass Co., St. Louis, Mo.
Michigan Malleable Iron Co., Detroit.
Michigan Steel Casting Co., Detroit.
Mid-City Foundry Co., Milwaukee.
Millinocket Foundry & Machine Co., Millinocket, Me.
Minster Machine Co., Minster, Ohio.
Moline Malleable Iron Co., St. Charles, Ill.
Motor Castings Co., West Allis, Wis.
F. E. Myers & Bro. Co., Ashland, Ohio.
Neenah Foundry Co., Neenah, Wis.
Newark Malleable Iron Works, Newark, N. J.
Newton Foundry Co., Newton, Iowa.
Nonferrous Foundries, Inc., Indianapolis, Ind.
Oberdorfer Foundries, Inc., Syracuse, N. Y.
Ohio Steel Foundry Co., Lima, Ohio.
Olds Alloys Co., South Gate, Calif.
Olympic Steel Works, Seattle, Wash.
Overmyer Mould Co., Inc., Winchester, Ind.
Pacific Steel Casting Co., Berkeley, Calif.
Pangborn Corp., Hagerstown, Md.
Parker Sweeper Co., Springfield, Ohio.
Paxton-Mitchell Co., Omaha, Neb.
Pelton Steel Castings Co., Milwaukee, Wis.
Penn. Steel Castings Co., Chester, Pa.
Plainville Casting Co., Plainville, Conn.
Pohlman Foundry Co., Inc., Buffalo.
Pullman-Standard Car Mfg. Co., Butler, Pa.
Pusey and Jones Corp., Wilmington.
J. F. Quest Foundry Co., Minneapolis.
Racine Aluminum & Brass Foundry, Racine, Wis.
Sacks-Barlow Foundries, Inc., Newark, N. J.
Sawbrook Steel Castings Co., Cincinnati.
T. Shriver & Co., Inc., Harrison, N. J.
Sibley Machine & Foundry Corp., South Bend, Ind.
Sprout, Waldron & Co., Inc., Muncy, Pa.
Superior Foundry, Inc., Cleveland.
Swayne, Robinson & Co., Richmond, Ind.
J. H. Taylor Foundry, Inc., Quincy, Mass.
Texas Foundries, Inc., Lufkin, Tex.
Textile Machine Works, Reading, Pa.
continued on page 94

Thunder Bay Mfg. Corp., Alpena, Mich.
Thys Co., Sacramento, Calif.
Treadwell Engineering Co., Easton, Pa.
Union Mfg. Co., Boyertown, Pa.
United Bronze Corp., Detroit, Mich.
Universal Foundry Co., Oshkosh, Wis.
Vulcan Foundry Co., Oakland, Calif.
Washington Iron Works, Seattle, Wash.
West Michigan Steel Foundry Co., Muskegon, Mich.
Westlectric Castings, Inc., Los Angeles.
West Point Foundry & Machine Co., West Point, Ga.
Whiting Corp., Harvey, Ill.

▶ *Health conference*

Developed cooperatively by the Division of Industrial Health of the Michigan Department of Health and the Michigan State College's School of Engineering, the second annual conference on industrial ventilation problems will be held Feb. 16-19 at the MSC School of Engineering, East Lansing, Mich.

The four-day program will feature addresses, panels and class study on the following subjects:

1. *"General Ventilation, Results of a Model Study."*
2. *"Velocities — Control, Slot, and Carrying."*
3. *"Effect of Fittings on Operation."*
4. *"Radiation, Heat and Comfort."*
5. *"Fan Problems."*
6. *"Make-up Air — Selection of Equipment."*
7. *"Collecting Atomic Waste."*
8. *"How to Maintain Maximum Efficiency."*

Speakers comprise an imposing group of ventilation specialists from industrial and research organizations as well as experts from various state and municipal health departments. (For a detailed program and any other information, write to L. G. Miller, Dean of Engineering, Michigan State College, East Lansing, Mich.)

▶ *Non-ferrous metallurgy*

Non-ferrous Physical Metallurgy . . Robert J. Raudebaugh, 345 pp. Illustrated. Published by Pitman Publishing Corp., New York, London, Toronto. (1952)

The latest addition to the Pitman Metallurgy Series, this book stresses recent developments in the processing, fabricating and application of non-ferrous metals. Among these are: the melting and casting of reactive metals such as molybdenum; the direct casting of billets and slabs of aluminum, magnesium and copper alloys; the fabrication of ductile titanium; and the application of powder metallurgy to the production of non-ferrous parts.

Letters

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will take the necessary steps to have that situation remedied and see that it does not recur.

I believe close observation of all other illustrations showing the handling of molten metal will indicate that the workers are wearing goggles and protective clothing as suggested under Safety First Notes in the text.

EDWIN W. DOE, *Education Div.*
American Embassy
Rio de Janeiro, Brazil

Advises foundryman

Contrary to what Disturbed Foundryman (page 105, October 1952) seems to think, experience is not a substitute for education nor is education a substitute for experience. Drafting, algebra, geometry, trigonometry—only a small part of the knowledge an engineer must have—must be learned and cannot possibly be gained through any equivalent experience. The value of formal education is that you go through with a program in a short time. It takes an exceptional person to persist in pursuit of his studies through eight or 10 years of night school work.

Most foundry organizations try to balance their future supervisory, technical and executive teams with both college men and those who have come up through the ranks and the Foundry Educational Foundation recommends this practice.

GEORGE K. DREHER, *Exec. Dir.*
Foundry Educational Foundation
Cleveland

Suggests adult education

Disturbed Foundryman should understand that qualifications of those who assume responsible positions include a knowledge of fundamental principles applying to the industry, an attitude that survival of the organization requires vision and a knowledge of what other industries are doing, and the ability to use the literature of related fields of interest to aid in solving current problems. Management in seeking supervision from the ranks must be able to find those people who have demonstrated that they know how to be teachers and leaders, not bosses. No one is trying to withhold advancement opportunities from those now employed. Acquiring of college graduates is the result of an industrial development which compels industry to keep abreast of current improvements.

How can the man in the ranks approach management and offer what the college graduate brings to the company? One way is by participating in an adult education program such as is sponsored in so many communities today.

PROF. D. C. WILLIAMS
Industrial Engineering Dept.
Ohio State University

We hope letters like the two above and those published in December 1952 (page 80) help clear the air regarding management's views on selection of supervisors.

▶ *Georg Fischer anniversary book received by A.F.S. library*

Hundertfunfzig Jahre Georg Fischer Werk 1802/1952 is the title of a lavishly printed book describing and illustrating the growth of the iron and steel and engineering firm of Georg Fischer, Limited, Schaffhausen, Switzerland. A copy of the book was recently sent to the A.F.S. library with the compliments of the company

The Georg Fischer firm is notable not only for its foundry and engineering achievements, but also for having established the "Iron Library" at Schaffhausen. It now contains about 8,000 volumes, and the number is being added to as the opportunity offers. Among the earlier books in the library is one written in 1534, showing how iron was used in military implements. The first systematic book on metallurgy, written in 1540 by an Italian, Vanuccio Biringuccio, is one of the volumes in the library.

Canadian regional

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To avoid hot tears, the following points should be watched: mold and core stresses; closed casting design; poor feed to any section of casting; poor quality melt; too high pouring temperature. Chills can be used to eliminate hot spots, and cracking ribs will absorb stresses, he declared, adding that there is less tendency toward hot tears with basic steel.

Thursday afternoon, buses were provided for plant visits to Crane Ltd., Robert Mitchell Co. Ltd., and Dominion Engineering Works Ltd. On the following day visits were made to Warden King, Ltd., Canadian Car & Foundry Co. Ltd. (steel foundry division), and Montreal Bronze Co. Ltd.

The Plant Visits Committee consisted of H. E. Francis (chairman), Jenkins Bros. Ltd., Montreal; G. W. Patterson, Refractories Engineering and Supply, Ltd., Montreal; and A. H. Thompson, Canadian Refractories Ltd., Montreal.

The General Organizing Committee had as chairman—A. E. Cartwright, Crane Ltd., Montreal; secretary—W. C. Rowe, Crane Ltd., Montreal; and Ontario Chapter Liaison Officer—Alex Pirrie, Standard Sanitary & Dominion Radiator, Ltd., Toronto.

Programme Committee included: H. Louette, Warden King Ltd., Montreal, chairman; J. G. Dick, Montreal Bronze Ltd., Montreal, and R. J. Young, Dominion Engineering Works, Ltd., Lachine, P. Q., associate chairman; and W. P. Sullivan, Warden King Ltd., Montreal, secretary.

Publicity Committee was headed by J. G. Hunt, Dominion Engineering Works Ltd., Lachine, Que. Program Book Committee leaders were W. C. Rowe, Crane Ltd., Montreal, chairman; and A. E. Cartwright, Crane Ltd., Montreal, editor.

Housing and Registration Committee was headed by J. H. Newman, Newman Foundry Supply Co., Ltd., St. Lambert, Que., chairman; and P. Von Colditz, Canadian Car & Foundry Co. Ltd., Montreal, vice-chairman.

Entertainment Committee chairman and vice-chairman, were respectively: P. B. Savoie, Webster & Sons Ltd., Montreal; and J. G. Dick, Montreal Bronze Ltd.

foundrymen

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ucts of the heating and ventilating divisions until last year when he became assistant general sales manager.

Thomas E. Moffitt, for the past year works manager of the Tacoma, Wash., plant, Hooker Electrochemical Co., Niagara Falls, N. Y., has been appointed western manager. **Horace W. Hooker Jr.,** since 1947 general purchasing agent, has been named western sales manager, succeeding **Albert H. Hooker,** whose health has caused an extended leave of absence.

James A. Davis was named assistant to Mel F. Burr, president and general manager of Electronicast Inc., Chicago producer of precision castings. He was formerly with the Blue Island branch of Acme Metal Products Corp.

Clinton F. Zabriskie has been appointed foundry metallurgist, Sperry Gyroscope Co. Great Neck, N. Y.

Norman J. McLeod has been named president-general manager, Safety Clothing & Equipment Co., Cleveland. For the last 10 years Mr. McLeod was vice-president, Royal Vacuum Cleaner Co. **Earl Brooks,** former president of Safety Clothing, has become chairman. **L. F. Brooks** continues as vice-president and **Lee Debes** as sales manager.

Robert Eldam recently joined American Steel Foundries, Hammond, Ind., as metallurgist, following graduation from Purdue University.

John A. Schumann has been appointed sales engineer, Carpenter Brothers Inc., Milwaukee, supplier of foundry sands, bonding clays and steel abrasives. Mr.

John A. Schumann . . . sales engineering.

Schumann was with Central Foundry Div., General Motors Corp., in Defiance, Ohio, as supervisor of sand controls, sand research development work and cupola metallurgical control.

How Lincoln Foundry Corp. complies with the strict Los Angeles County Atmospheric Pollution Code is told on page 61 by **J. E. I'Anson,** vice-president of the company, **T. L. Harsell, Jr.,** West Coast consultant, and **R T. Pring,** technical director, American Wheelabrator & Equipment Corp., Mishawaka, Ind. The unit is described complete with operating data and costs; data before and seven months after installation are included.

T. M. Blank has been elected vice-president, Carbon Malleable Castings Corp., Lancaster, Pa. He has been plant manager since 1949 and was formerly associated with Columbia Malleable Div., Grinnell Inc., Columbia, Pa.

Leon Burnett, formerly associated with Pyott Foundry, Chicago, has been appointed manager of Kenton Foundry Co., division of Bruce Foundry & Manufacturing Co., Tecumseh, Mich.

William H. Cantwell has been appointed managing director, Eastern Malleable Iron Co., Wilmington, Del., succeeding the late **George E. M. Bean.** Mr. Cantwell worked as a summer employee with Eastern Malleable while attending Pratt Institute of Technology. In 1922 he became assistant foreman in the Wilming-

ton plant, and worked successively as foundry foreman and assistant superintendent there and then as assistant superintendent of the Cleveland plant. He returned to Wilmington in 1938 as superintendent and in 1943 was named assistant managing director.

Alfred A. Diebold has been named vice president of operations, Atlas Steel Casting Co., Buffalo. Mr. Diebold, who has been with the Company 34 years, has been works manager since 1942.

▶ *obituaries*

William Schneider, 90-year-old pioneer foundryman of Denever who has been associated with the bronze and brass industry 75 years, died November 16, 1952. Until two years ago Mr. Schneider

William Schneider . . . pioneer foundryman.

was active in the management of Western Bronze & Brass Foundry, Denver. At that time he was said to be the oldest active founder in the country having entered the industry in 1875 as an apprentice with Pioneer Brass Works, Indianapolis, a company founded by his father. He became associated with Terre Haute Bronze & Brass Co. in 1880 which he sold in 1903 when he moved to Denver to buy the old Desserick firm. In 1928 he moved the plant to its present address under the name Western Bronze & Brass Foundry. Mr. Schneider once turned to professional ball for a career. In the 80's he was catcher, manager and owner of the Terre Haute, Ind. team of the "Three Eye" league.

Harvey Nathaniel Davis, 71, third president of Stevens Institute of Technology, Hoboken, N. J., died in Roosevelt Hospital, New York City, December 3. He retired in 1951 after 23 years as president of Stevens.

Alfred M. Jones, 64, died recently of a heart attack. He was born in New Haven, Conn. Mr. Jones came to Milwaukee in 1914 to become vice-president and superintendent of the Federal Malleable Foundry Co. He was a Midwest representative of the International Graphite & Electrode Co. for 15 years, and vice-president of Carpenter Bros., Inc., dealers in foundry sand. He was an active member of the Milwaukee chapter of A.F.S.

Alfred M. Jones, Midwest sales representative for International Graphite & Electrode Div., Saint Marys, Pa., died in Milwaukee of a heart attack December 8. He had been with company since 1934.

Kendall B. Rowell, 52, chief engineer of American Locomotive Co., Schenectady, N. Y., died December 12. Mr. Rowell had been appointed Alco chief engineer November 1951. He was responsible for product development and engineering in the company's locomotive division.

Kent S. Clow, 64, Chicago Industrialist, a leader in the Republican party and in civic affairs, died December 14. Mr. Clow was president of James B. Clow & Sons, manufacturers of plumbing and waterworks supplies, and of its subsidiaries, the Eddy Valve Co. of Waterford, N. Y. and the Iowa Valve Co. of Oskaloosa, Iowa. He was a native of Chicago and a graduate of Yale university. He had been a Lake Forest resident for 30 years and a director of the First National Bank of Lake Forest.

free information

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For further informaton about free literature use the card on page 18.

Heavy lifting is reduced. Bad working conditions and unsafe practices are eliminated. Low man-hours per ton handled. Engineering data and installation photographs shown. *The Forker Corporation.*

For more data circle No. 26 on card, page 18

Die casting machines

Main operating parts and special features of Cast-Master die casting machines are shown and labeled in photos in new bulletin, which also pictures various other models. *Cast-Master, Inc.*

For more data circle No. 27 on card, page 18

Hydraulic cylinders

Complete line of hydraulic cylinders is catalogued in new 28-page bulletin. Photos, diagrams, charts explain the various mountings and capacities. *Lindberg Engineering Co.*

For more data circle No. 28 on card, page 18

Welding and impregnating

Dot welding and an impregnating process designed as a low-cost method for salvaging castings rejected for porosity are described in two booklets illustrated by photos of job applications. Booklets list costs, features of equipment, and names of users. *Metallizing Co. of America.*

For more data circle No. 29 on card, page 18

Arc welding

Photos and colored illustrations in 20-page news magazine show typical applications of arc welders and accessories, describe equipment. Books on welding and free electrode guide are also announced. *Hobart Brothers Co.*

For more data circle No. 30 on card, page 18

Thermocouple sheath parts

Catalog illustrates and describes sleeves, standard taper plugs, and threaded end bushings used in thermocouple measurement of steel bath temperatures for close control of tapping. *National Carbon Co.*

For more data circle No. 31 on card, page 18

Cutting torch

How to cut and gouge all metals with torch using only carbon arc and compressed air is described and illustrated in four-page folder. Typical applications include removing pads and gouging defects in stainless steel and alloy steel castings. Folder explains operation and gives average costs. *Arcair Company.*

For more data circle No. 32 on card, page 18

Electrode comparator

Slide rule permits comparing General Electric welding electrodes with those of other manufacturers in a matter of seconds. *General Electric.*

For more data circle No. 33 on card, page 18

coming events

January

19. . Northern California
Hotel Shattuck, Berkeley. C. V. Nass, Beardsley & Piper Div., Pettibone-Mulliken Corp., Chicago. *"Mechanization in Molding."*

19. . Quad City
Hotel Ft. Armstrong, Rock Island, Ill. Panel discussions of *"Bonding Materials," "Cupola Patching,"* and *"Strainer Cores."*

19-22. . Plant Maintenance Show & Conference
Public Auditorium, Cleveland.

20. . Eastern New York
Circle Inn, Latham, N. Y. William T. Bean, Jr. *"Good Casting Design on Purpose."*

21. . Central Michigan
Hart Hotel, Battle Creek, Mich. Wm. G. Ferrel, Auto Specialties Manufacturing Co., St. Joseph, Mich. *"Cupola Practice."*

21. . Oregon
C. V. Nass, Beardsley & Piper Div., Pettibone-Mulliken Corp., Chicago. *"Mechanization in Molding."*

22. . Washington
Stewart Hotel, Seattle. C. V. Nass, Beardsley & Piper Div., Pettibone-Mulliken Corp., Chicago. *"Mechanization in Molding."*

23. . Malleable Founders' Society
Hotel Cleveland, Cleveland. General meeting.

23. . British Columbia
Vancouver Vocational Institute. C. V. Nass, Beardsley & Piper Div., Pettibone-Mulliken Corp., Chicago. *"Mechanization in Molding."*

26. . Northwestern Pennsylvania
Moose Club, Erie, Pa. L. D. Richardson, Eutectic Welding Alloys Corp. *"Proper Weldments for Various Metals."*

30. . Ontario
Kirby Hotel, Bradford, Ont. Group Meetings. Ferrous: R. Klingberg, Hartley Foundry Div., London Concrete Machine Co., Ltd., Bradford, Ont. Non-Ferrous: H. McHattie, Barnard Foundries, Ltd., Bradford, Ont.

February

2. . Central Illinois
American Legion Hall, Peoria, Ill. Wm. Ball, Jr., R. Lavin & Sons, Inc., Chicago. *"Effective Essentials Required to Make Good Castings."*

2. . Chicago
Chicago Bar Association. Round Table Meetings. Gray Iron & Pattern: Joint Meeting. Malleable: *"Air Furnace Brick Bottoms."* Non-Ferrous: *"Precision Molding Methods."* Steel: *"Sand."*

2. . Central Indiana
Athenaeum Bldg., Indianapolis. Panel Discussion. B. A. Lawson, Harrison Steel Castings Co., Attica, Ind.

2. . Metropolitan
Essex House, Newark, N. J. L. D. Pridmore, International Molding Machine Co., La Grange Park, Ill. *"Mold and Core Blowing."*

3. . Rochester
Seneca Hotel, Rochester, N. Y. Walter Siebert, Elyria Foundry Div., Industrial Brown Hoist Corp. *"Practical Construction of Wood Patterns."*

5. . Saginaw Valley
Fischer's Hotel, Frankenmuth, Mich. Dr. Guy Hill, Michigan State College.

5. . Canton District
Moose Club, Barberton, Ohio. Alex Barczak, Superior Foundry, Inc., Cleveland. *"Synthetic Sand in a Production Foundry."*

6. . Western New York
Thomas E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Co., Chicago. *"Cupola Operation."*

6-7. . California Regional Fdy. Conf.
Claremont Hotel, Berkeley. Sponsored by A.F.S. Northern California and Southern California Chapters and the University of California.

9. . Central Ohio
Seneca Hotel, Columbus, Ohio. T. E. Eagan, Cooper-Bessemer Corp., Grove City, Pa. *"Aspects of Nodular Iron."*

9. . Michiana
Morris Park Country Club, South Bend, Ind. George Anselman, Beloit Foundry Co., Beloit, Wis.

9. . Cincinnati
Earl E. Woodliff, Foundry Sand Engineer, Detroit. *"How Far Must We Go in Sand Control?"*

10. . Twin City
Covered Wagon, Minneapolis. Hiram Brown, Solar Aircraft Co., De Moines. *"Lightweight Training."*

10. . N. Illinois - S. Wisconsin
Faust Hotel, Rockford, Ill. Harry Gravlin, Ford Motor Co., Detroit. *"Men, Metal, Sand.."*

12. . Northeastern Ohio
Tudor Arms Hotel, Cleveland. Speaker sponsored by Pattern Making Div.

12. . St. Louis District
York Hotel, St. Louis, Mo. Charles B. Schureman, Bariod Sales Div., National Lead Co., Chicago, Ill. *"Foundry Sands."*

12-13. . Wisconsin Regional Fdy. Conf.
Schroeder Hotel, Milwaukee. Sponsored by Wisconsin Chapter and University of Wisconsin.

13. . Philadelphia
Engineers' Club, Philadelphia. W. S. Pellini, Naval Research, Anacostia, D. C. Also Lebanon Steel Foundry film.

13. . Eastern Canada
Mount Royal Hotel, Montreal, Que. Forum: Material Handling.

13. . Central New York
Onondaga Hotel, Syracuse, N. Y. S. C. Massari A.F.S. Technical Director. *"Effect of Gating Design on Casting Quality."*
continued on page 100

February

16. .Quad City
Hotel Ft. Armstrong, Rock Island, Ill. W. W. Levi, Lynchburg Foundry Co., Radford, Va.

16-19. .Industrial Ventilation Conf.
Kellogg Center for Continuing Education, Michigan State College, East Lansing, Mich.

16-20. .Nat'l. Asso. Corrosion Engrs.
Chicago. Symposium: *"Protective Coatings."*

17. .Eastern New York
Circle Inn, Latham, N. Y. George K. Dreher, Foundry Education Foundation.

18. .Central Michigan
Hart Hotel, Battle Creek, Mich.

19-20. .Southeastern Regional Conf.
Tutwiler Hotel, Birmingham, Ala. Sponsored by Birmingham District & Tennessee Chapters and University of Alabama Student Chapter.

19. .Washington
Rose's Chicken Inn, Seattle, Tacoma Highway. L. W. Eastwood, Kaiser Aluminum & Chemical Corp. *"Non-Ferrous Foundry Practice."*

19. .Detroit
Father & Son Night. L. D. Richardson, Eutectic Welding Alloys Corp., Flushing, N. Y. *"Tricks in the Trade in Welding."*

20. .Texas
Beaumont, Texas. William Ball, Jr., R. Lavin & Sons, Inc., Chicago. *"Effective Essentials Required to Make Good Castings."* (Non-ferrous)

27. .Chesapeake
Engineers Club, Baltimore, Md. Donald LaVelle, Federated Metals Div., American Smelting & Refining Co., *"Aluminum Test Bars—Their Meaning & Production."*

27. .Ontario
Toronto, Ont. S. C. Massari, A.F.S. Technical Director. *"Effect of Gating Design on Casting Quality."*

27. .Tennessee
Thomas E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Co., Chicago. *"Sand Casting Defects & Relation to Sand."*

27. .Malleable Founders' Society
Drake Hotel, Chicago. Western sectional meeting.

March

2-6. .American Society for Testing Materials
Statler Hotel, Detroit. Spring Meeting.

11-12. .Foundry Educational Foundation
Cleveland. TAC-UAC Conference.

16-18. .Nat'l. Asso. Waste Material Dealers, Inc.
Conrad Hilton, Chicago. 40th Annual Convention.

16-20. .Nat'l. Asso. Corrosion Eng.
Chicago. Protective Coatings Symposium.

convention housing

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ing and distribution prior to the convention. Papers received after December 15 can still be scheduled but preprinting is not guaranteed.

In addition to the 50 technical meetings scheduled—including the popular, informal shop courses and round table luncheons, there is a series of social events headed by the Annual Banquet, to be held the evening of Wednesday, May 6. President I. R. Wagner, Electric Steel Castings Co., Indianapolis, will preside, and A.F.S. Gold Medals and Honorary Life Memberships will be presented. Other traditional social events concentrated in the middle of Convention Week include the Canadian Dinner, the Past Presidents' Breakfast, and the A.F.S. Alumni Dinner. A program for the ladies will run throughout the week.

The Annual Business Meeting with the Presidential Address, election of officers and directors, and presentation of awards to first place winners in the A.F.S. Apprentice Contest, heads the schedule of events for the morning of Thursday, May 7. Immediately following is the Charles Edgar Hoyt Annual Lecture which will be delivered by James H. Smith, general manager, Central Foundry Div., General Motors Corp., Saginaw, Mich., a past national director of A.F.S.

▶ *Cope and Drag Club meets*

Cope and Drag Club members met in Cleveland December 4 and 5 to discuss high pressure molding techniques and modernization of small foundries, and to visit the Cleveland foundry of Ford Motor Co. Roy W. Bennett, Walter Gerlinger, Inc., Milwaukee, described research in molding pressures up to 1,000 psi as compared to the commonly-used 25 to 50 psi. Tolerances of 0.003 in. were reported.

Clifford E. Wenninger, National Engineering Co., Chicago, outlined a program of modernization for a shop of about 50 men. Equipment recommended was a motorized scoop for transporting sand and castings, a conveyor for sorting, magnetic pulley to keep sand free of ferrous metal, an elevator, and a bin capable of holding one sand-mixer load. He advised that foundry equipment must be properly maintained.

▶ *Announce prize paper contest*

Awards totaling $2,250 are being offered during 1953 by the Resistance Welder Manufacturer's Association for outstanding papers dealing with resistance welding subjects. For full information and contest rules, write to the Association at 1900 Arch St., Philadelphia 3, Pa.

index to Advertisers

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■ To contact advertisers with code number, write to AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Ill. In replying to 'Help Wanted," send outline of background.

▶ Help Wanted

Superintendent

Opportunity for well qualified, experienced superintendent of non-ferrous foundry employing 100 to 150. Applicant should be between 35 and 45. Enclose photograph and state complete record of education and experience in detail including previous employment and length of service. **HW-602**

Industrial Engineer

List past experience, also state salary expected in first letter. Must be familiar with foundry work. **HW-614**

Core Oil Salesman

Territory open in Western New York state for aggressive man to sell well known line of core oils manufactured by 40 year old concern. No objection to handling other lines. Liberal commission. **HW-617**

Foundry Engineers and Draftsmen

Having foundry operating or plant experience. Write, enclosing photograph and complete record of education and experience in detail, including previous employers and length of service. State age and salary expected.

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Core Oil Salesman

Territory open in Western Pennsylvania for aggressive man to sell well known line of core oils manufactured by 40 year old concern. No objection to handling other lines. Liberal commission. **HW-620**

Grinding Wheel Salesman

Position open for a qualified man in selling a nationally known grinding wheel line in Southern California. Primary sales activity would concern foundries and similar basic industry users. All inquiries strictly confidential. **HW-621**

Field Service Men

Excellent opportunity for men to demonstrate correct use of synthetic resin core binders in Midwest. Car, salary, bonus and expense account. Provide full details and references. **HW-622**

Refractories Salesman

Opportunity with long established refractories manufacturer. Applicant should have experience in industrial selling, preferably to metal melting industries. Prefer applicant between 27-35 years, willing to travel. Locations: Midwest and East. **HW-623**

Foundry Melter

Foundry melter, duplex malleable melting, large foundry in Midwest. Must be willing to learn and study melting practices. Write, state education, training, experience (not essential) in letter. **HW-625**

REPRESENTATIVES

Electronic Core Baking Equipment

Leading manufacturer has several territories to offer. Unusual opportunity available for qualified men who can sell. Write giving all qualifications. HW-624

Non-Ferrous Superintendent

To take charge of large non-ferrous in the Midwest. This position requires a man who has the knack of getting people to work for him, who has the organizational ability to get things done and who is fully acquainted with modern foundry production methods. The position offers an excellent opportunity both financially and as a stepping stone to a more responsible position. **HW-626**

Gray Iron Superintendent

Multi-plant organization requires man with ten years' experience in gray iron foundry operations, preferably with metallurgical degree. Must be well versed in all modern methods of foundry production, including continuous molding operations, cupola practice, sand slingers and sand control. Expanding industry with liberal retirement, hospitalization and insurance programs. Send resume to **HW-627**

Foundry Service Man

Man to service customers of large aluminum sand foundry making large complicated castings for defense. Write giving experience and salary expected. **HW-628**

Permanent Mold Specialist

Specialist in brass permanent mold fittings disposing of a process of his own, offers his services for setting up the casting process. Smooth, dense castings, permanent in size, guaranteed. **N-142**

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UNIFORM

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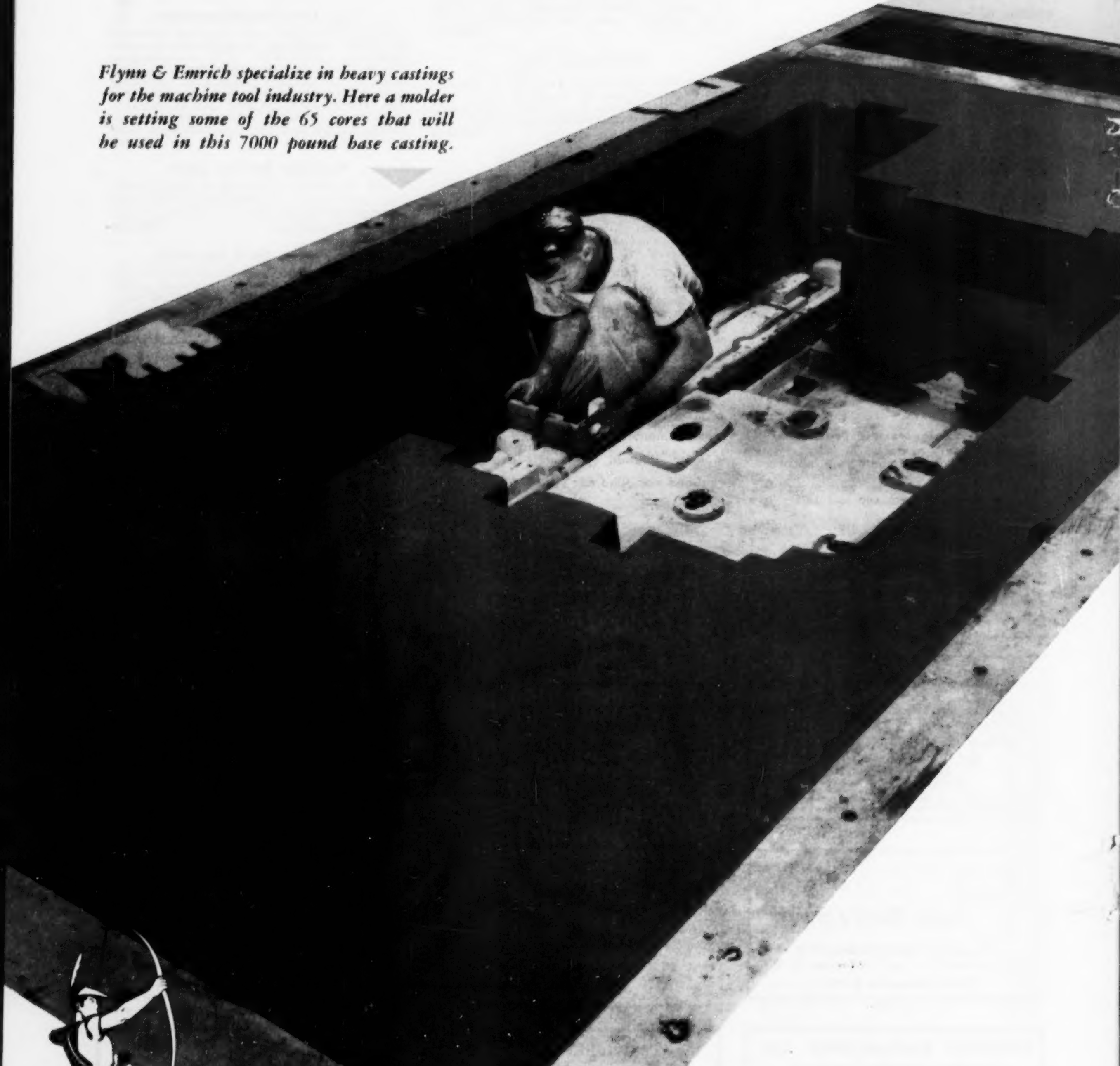
Flynn & Emrich specialize in heavy castings for the machine tool industry. Here a molder is setting some of the 65 cores that will be used in this 7000 pound base casting.



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